

Glacier Bay Compensation Plan Economic Assessment

Final Report

**Prepared for:
National Park Service**

August 1, 2000

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**Prepared for:
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Prepared by:



Juneau • Anchorage

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Executive Summary

The purpose of this study is to predict the economic losses associated with commercial fishing closures and restrictions in Glacier Bay. The scope of the study includes measurement of future losses suffered by commercial fishermen, crew, processors and their employees, businesses providing goods and services to fishermen and processors, and communities.

This study only attempts to measure economic losses to these groups. It does not prioritize losses, nor does it define the criteria that may ultimately be used to determine who will qualify for compensation. The study does not estimate losses to any particular individual or business.

It is very important to recognize the uncertainty associated with predicting future economic losses stemming from commercial fishing restrictions and closures in Glacier Bay. This uncertainty stems from several sources, including data limitations. For some fisheries there simply are no data available on past commercial fishing activity in Glacier Bay. For fisheries where data is available, there are concerns about the accuracy of the data. There is uncertainty about the future health of fish stocks, management of those stocks, and the ability of displaced Glacier Bay fishermen to replace their lost Glacier Bay harvest with fish from other waters. Assumptions about how present and future managers of Southeast Alaska's seafood resources might respond to the closure of Glacier Bay are critical in determining losses to fishermen, processors and others. There is uncertainty about future markets for Alaska's seafood products. Does the value of past Glacier Bay catch and production accurately reflect the value of Glacier Bay resources in the future? There is even uncertainty about the most appropriate way to estimate the present value of future losses.

In light of this uncertainty, the study team's intent for this economic assessment is to provide the National Park Service (NPS) with the best available information on the economic impacts of commercial fishing in Glacier Bay. This includes historical harvest data, discussion of the factors that could influence closure-related losses, and presentation of a range of potential losses that appropriately reflect the uncertainty in the analysis.

Key findings of this assessment are summarized below.

Value of Glacier Bay Commercial Fisheries

In the recent past, approximately \$2.4 million in seafood has been harvested annually from Glacier Bay. This estimate is based on the annual first wholesale value of Tanner crab (\$900,000), halibut (\$800,000), Dungeness crab (\$500,000), king salmon (\$100,000), groundfish (\$50,000) and king crab (\$20,000), taken from Glacier Bay. These estimates are based on average annual harvests during the 1989 to 1998 period (depending on data availability).

These values do not represent losses to fishermen, processors and others, however, because lifetime access permit holders will continue to fish in parts of Glacier Bay, presumably for many years into the future. These values also do not necessarily reflect losses to fishermen, processors and others because – in some fisheries – fishermen will be able to replace their lost Glacier Bay harvest with harvests from other waters.

Present Value of Future Losses

Economic losses associated with closing Glacier Bay will occur gradually over time. The Dungeness, groundfish and king crab fisheries are closed in Glacier Bay. Certain wilderness and non-wilderness waters are now closed to all commercial fishing. Further, over the next 25 to 30 years (and perhaps longer), the Tanner, halibut and salmon fisheries will be gradually eliminated as lifetime permit holders retire.

This economic assessment predicts annual losses in Glacier Bay fisheries 75 years into the future (for all practical purposes, this represents losses “in perpetuity,” that is, forever). These future annual losses are then reduced – discounted – to a lump-sum present value. Discounting is required to find the equivalent value today of money receivable or payable in the future. In other words, because of the time value of money, an amount owed or receivable in the future has less value today.

To discount future losses to a present value, two discount rates are used in this assessment, 3.0 percent and 5.3 percent. Rational, defensible arguments can be made in support of a range of discount rates. In fact, determination of the most appropriate discount rate is somewhat subjective. Three percent is the discount rate used in the State of Alaska’s estimate of Glacier Bay-related losses. It is also the rate recommended by the NPS for analysis of social policy. The 5.3 percent discount rate represents a risk-adjusted rate that reflects the business risk inherent in the commercial fishing industry.

Lower discount rates result in higher present values and higher rates result in lower present values. Changing the discount rate, however, does not change the distribution of losses among the affected fisheries and affected groups within those fisheries.

Potential Losses

Potential losses are defined as those losses that will occur if fishermen and processors do not have the ability or opportunity to fully replace their lost Glacier Bay harvest with fish harvested elsewhere. Potential losses also represent real losses in those fisheries that target Glacier Bay-resident populations of fish (rather than migratory or wide-ranging fish that pass through Glacier Bay). These potential losses could be viewed as the worst-case scenario. As described below, this worst-case scenario is expected in some fisheries, but not in others.

Potential (worst case) losses are summarized in Tables S-1 and S-2. Potential losses range from \$28.6 million (5.3 percent discount rate) to \$51.6 million (3.0 percent discount rate). These totals represent potential losses to *current and future* permit holders, crew, processors, support businesses, and lost fish tax revenues. Further, these totals include potential losses to permit holders with lifetime access, as well as permit holders without lifetime access. These potential losses represent worst case scenarios (all commercial value will be lost and not replaced). Actual losses are predicted to be less, depending on assumptions made about the Glacier Bay halibut fishery.

Table S-1

**Present Value of *Potential* Future Losses
By Fishery and Group, 5.3% Discount Rate**

<i>Harvest-related Totals</i>	Tanner Pot	Tanner Ring	Halibut	Dungeness
Permit Holders	\$3,468,000	\$352,000	\$5,139,000	\$1,161,000
Vessel Crew	1,646,000	47,000	1,101,000	760,000
Harvest Support Business	611,000	56,000	881,000	689,000
Subtotal	\$5,725,000	\$455,000	\$7,122,000	\$2,610,000
<i>Processing Related Totals</i>				
Processors	1,915,000	151,000	1,605,000	2,847,000
Processor Employees	525,000	27,000	259,000	644,000
Processing Support Businesses	223,000	22,000	217,000	848,000
Fish Tax Revenue	176,000	14,000	220,000	152,000
Subtotal	\$2,840,000	\$214,000	\$2,302,000	\$4,491,000
Grand Total	\$8,565,000	\$669,000	\$9,424,000	\$7,101,000

Table S-1 (continued)

<i>Harvest-related Totals</i>	Troll	Groundfish	King Crab	Totals
Permit Holders	\$742,000	\$303,000	\$123,000	\$11,288,000
Vessel Crew	72,000	93,000	59,000	3,778,000
Harvest Support Business	148,000	56,000	22,000	2,463,000
Subtotal	\$961,000	\$452,000	\$204,000	\$17,529,000
<i>Processing Related Totals</i>				
Processors	\$250,000	\$575,000	60,000	7,402,000
Processor Employees	24,000	144,000	13,000	1,636,000
Processing Support Businesses	41,000	64,000	7,000	1,422,000
Fish Tax Revenue	30,000	14,000	6,000	613,000
Subtotal	\$345,000	\$796,000	\$86,000	\$11,074,000
Grand Total	\$1,306,000	\$1,248,000	\$290,000	\$28,603,000

Note: Subtotals may not add to totals due to rounding.

Table S-2

**Present Value of *Potential* Future Losses
By Fishery and Group, 3.0% Discount Rate**

<i>Harvest-related Totals</i>	Tanner Pot	Tanner Ring	Halibut	Dungeness
Permit Holders	\$6,803,000	\$584,000	\$9,481,000	\$1,866,000
Vessel Crew	3,228,000	78,000	2,032,000	1,222,000
Harvest Support Business	1,199,000	93,000	1,625,000	1,108,000
Subtotal	\$11,230,000	\$756,000	\$13,138,000	\$4,197,000
<i>Processing Related Totals</i>				
Processors	\$3,753,000	\$250,000	\$2,961,000	\$4,577,000
Processor Employees	1,029,000	45,000	478,000	1,035,000
Processing Support Businesses	437,000	37,000	401,000	1,363,000
Fish Tax Revenue	346,000	23,000	406,000	244,000
Subtotal	\$5,565,000	\$356,000	\$4,246,000	\$7,220,000
Grand Total	\$16,796,000	\$1,112,000	\$17,384,000	\$11,416,000

Table S-2 (continued)

<i>Harvest-related Totals</i>	Troll	Groundfish	King Crab	Totals
Permit Holders	\$1,397,000	\$486,000	\$198,000	\$20,816,000
Vessel Crew	134,000	150,000	94,000	6,938,000
Harvest Support Business	278,000	90,000	35,000	4,429,000
Subtotal	\$1,809,000	\$726,000	\$327,000	\$32,183,000
<i>Processing Related Totals</i>				
Processors	465,000	\$924,000	96,000	13,025,000
Processor Employees	44,000	231,000	22,000	2,884,000
Processing Support Businesses	76,000	102,000	11,000	2,428,000
Fish Tax Revenue	57,000	22,000	10,000	1,109,000
Subtotal	\$641,000	\$1,280,000	\$138,000	\$19,446,000
Grand Total	\$2,450,000	\$2,006,000	\$466,000	\$51,629,000

Note: Subtotals may not add to totals due to rounding.

Predicted Losses

Fishermen in certain fisheries will be able to replace some or all of their lost Glacier Bay harvest with fish harvested from other waters. Further, wide-ranging or migratory fish formerly harvested in Glacier Bay may be still be (after closure) available for harvest outside the Bay. In fisheries where this is true, the potential losses presented in Tables S-1 and S-2 may not reflect actual losses likely to be suffered by fishermen and others. Each fishery is considered individually in this regard:

- **Tanner crab fishery:** ADF&G managers have stated that the guideline harvest level for the Southeast Tanner fishery will decline by the same poundage that the Glacier Bay harvest declines. Therefore, the value of Glacier Bay Tanner harvest will be entirely lost over time as lifetime access fishermen retire from the fishery.¹ There will be no collective opportunity for substitution from other grounds. Individual fishermen will fish other grounds and replace some or all of their Glacier Bay harvest, but not the Southeast Tanner fleet collectively. In other words, the potential losses presented in Tables S-1 and S-2 represent actual losses for present *and future* participants in the Tanner crab fishery. It also includes losses to fishermen who have never fished in Glacier Bay, but will suffer dislocation effects and/or declining permit values. Over the period 1990 through 1998, the Glacier Bay Tanner harvest accounted for approximately 10 percent of the total Southeast harvest, ranging from 7 percent in 1991 to a high of 18 percent in 1997.
- **Dungeness crab fishery:** ADF&G fishery managers indicate that the loss of Glacier Bay will affect regional Dungeness crab management, though at this point in time it is not possible to predict how. Over the period 1989 through 1998, the Glacier Bay Dungeness harvest accounted for approximately 6 percent of the total Southeast harvest, ranging from 3 percent in 1997 and 1998 to a high of 12 percent in 1993.

Though the Dungeness fishery is not currently managed under a quota system, fishery managers indicate that a harvest limit or quota system will be implemented in the near future. In considering the impacts on fishermen from closing Glacier Bay, managers point out that all productive Dungeness grounds in Southeast are now fished. Loss of Glacier Bay will increase competition in other productive areas and will affect other, non-Glacier Bay fishermen. Further, there is limited opportunity for fishermen to replace their Glacier Bay harvest with harvests from nearby waters.

Finally, the commercial value of the Glacier Bay Dungeness resource has been reduced to zero. Regardless of the industry's ability to replace the lost Glacier Bay harvest, because it is a local resource (non-migratory), the commercial fishing industry and the State of Alaska have lost the opportunity to profit on that commercial value. Therefore, the potential losses presented in Tables S-1 and S-2 represent expected actual losses for present and future participants in the Dungeness fishery, including fishermen with a history in Glacier Bay and fishermen who may suffer dislocation and/or permit value effects.

Dungeness fishery losses estimated in the study exclude losses suffered by, and compensation paid to, permit holders who were bought out by the NPS.

¹ Based on the assumption that the Southeast Tanner fishery is a "price-taker" and therefore declining production will not be offset by rising prices.

- **Halibut fishery:** The International Pacific Halibut Commission (IPHC) has stated that no reduction in the Area 2C quota will occur as a result of declining harvests in Glacier Bay. Over the period 1992 through 1998, the Glacier Bay halibut harvest accounted for approximately 3 percent of the total Southeast harvest, ranging from 1.7 percent in 1993 to a high of 3.9 percent in 1995.

To the extent that the Glacier Bay halibut resource is a resident resource (which has been suggested by federal government research), the commercial value of the Glacier Bay harvest has been lost. Even if future management of the halibut fishery does not fully reflect the loss of the Glacier Bay resource, the commercial fishing industry and the State of Alaska have lost some or all of that commercial value. From this perspective, the potential losses presented in Tables S-1 and S-2 represent actual losses for present and future participants in the halibut fishery.

Nevertheless, if it is accepted that the Glacier Bay halibut resource is migratory, and that the 2C quota will not be reduced, losses are not equal to the value of the Glacier Bay harvest. Losses to current participants in the halibut fishery will be limited to those incurred as a result of increased expenses and declining profits on the affected volume of quota shares. This decline in profits will result from increased expenditures on food, fuel, bait and gear, as more time and effort is required to harvest Glacier Bay fishermen's quota shares. Based on specific assumptions made about this decline in profits, the present value of future losses to quota share holders could total between \$1.2 million and \$1.6 million (5.3 percent and 3.0 percent discount rates, respectively). Losses to crew could total between \$190,000 to \$245,000. These losses are limited to those fishermen with Glacier Bay history. No dislocation effects are assumed.

Losses to halibut processors would be limited to the profit margin on unfilled quota. There could also be some redistribution effects. Processor losses associated with unfilled quota are estimated at \$180,000 to \$195,000. It is not possible to predict how the halibut harvest will ultimately be redistributed in northern Southeast Alaska as the Glacier Bay harvest diminishes. However, to the extent that redistribution occurs, some business and communities could experience losses while others experience gains associated with Glacier Bay closures.

The wide range of potential versus actual losses in the halibut fishery clearly illuminates the importance of the assumptions made in the analysis. Assumptions that no management action will be taken in response to Glacier Bay closure, that the resource is migratory (and not resident), and that the Area 2C halibut resource is fully able to replace the lost Glacier Bay resource are critical. Depending on these assumptions there is very wide range of possible losses stemming from closure of Glacier Bay. Clearly, calculation of estimates of losses requires subjective assumptions. The criteria used to determine eligibility for compensation should reflect this uncertainty and subjectivity.

- **Troll fisheries:** Eventual loss of the troll fishery in Glacier Bay will not affect Southeast region management of the king salmon fishery. However, for reasons described in this report, permit holders could experience increased costs and reduced profits. Based on specific assumptions about reduced profitability, the present value of future losses to power troll permit holders totals approximately \$300,000 to \$450,000. The present value of future losses to hand troll permit holders totals approximately \$70,000 to \$110,000 (based on discount rates of 5.3 percent and 3.0 percent, respectively). Processor losses associated with reduced power troll harvests have a present value of between \$78,000 and \$118,000, based on discount rates of 5.3 percent and 3.0 percent, respectively. Processor losses associated with the hand troll fishery range between \$17,000 and \$25,000.
- **Groundfish:** Much of the measured potential losses apparently center on the operations of one processor. Measuring that processor's losses will require detailed audit of that business's operations and finances, an exercise that will occur after eligibility criteria have been developed and application for compensation is made. While actual losses could be substantially different than presented here, the range of losses summarized in Tables S-1 and S-2 serves as a reasonable guide, pending determination of actual losses suffered by the key affected business.
- **King crab fishery:** Management action in response to closing Glacier Bay to commercial king crab fishing is unlikely, given that the Bay harvest has been small and has accounted for a very small percentage of the regional harvest (less than 1 percent). On the other hand, to the extent that the Glacier Bay king crab resource is a resident resource, the full value of the fishery will be lost. The predicted losses presented in Tables S-3 and S-4 are based on the loss of the full value of the resource.

Predicted losses in each fishery are summarized in Tables S-3 and S-4.

Table S-3

**Present Value of *Predicted* Future Losses
By Fishery and Group, 5.3% Discount Rate**

<i>Harvest-related Totals</i>	Tanner Pot	Tanner Ring	Halibut	Dungeness
Permit Holders	\$3,468,000	\$352,000	\$1,202,000	\$1,161,000
Vessel Crew	1,646,000	47,000	192,000	760,000
Harvest Support Business	611,000	56,000	0	689,000
Subtotal	\$5,725,000	\$455,000	\$1,394,000	\$2,610,000
<i>Processing Related Totals</i>				
Processors	1,915,000	151,000	179,000	2,847,000
Processor Employees	525,000	27,000	0	644,000
Processing Support Businesses	223,000	22,000	0	848,000
Fish Tax Revenue	176,000	14,000	25,000	152,000
Subtotal	\$2,840,000	\$214,000	\$204,000	\$4,491,000
Grand Total	\$8,565,000	\$669,000	\$1,598,000	\$7,101,000

Table S-3 (continued)

<i>Harvest-related Totals</i>	Troll	Groundfish	King Crab	Totals
Permit Holders	\$374,000	\$303,000	\$123,000	\$6,982,000
Vessel Crew	28,000	93,000	59,000	2,825,000
Harvest Support Business	0	56,000	22,000	1,435,000
Subtotal	\$402,000	\$452,000	\$204,000	\$11,242,000
<i>Processing Related Totals</i>				
Processors	96,000	575,000	60,000	5,822,000
Processor Employees	0	144,000	13,000	1,353,000
Processing Support Businesses	0	64,000	7,000	1,164,000
Fish Tax Revenue	12,000	14,000	6,000	399,000
Subtotal	\$108,000	\$796,000	\$86,000	\$8,739,000
Grand Total	\$510,000	\$1,248,000	\$290,000	\$19,981,000

Note: Subtotals may not add to totals due to rounding.

Table S-4

**Present Value of *Predicted* Future Losses
By Fishery and Group, 3.0% Discount Rate**

<i>Harvest-related Totals</i>	Tanner Pot	Tanner Ring	Halibut	Dungeness
Permit Holders	\$6,803,000	\$584,000	\$1,561,000	\$1,866,000
Vessel Crew	3,228,000	78,000	243,000	1,222,000
Harvest Support Business	1,199,000	93,000	0	1,108,000
Subtotal	\$11,230,000	\$756,000	\$1,805,000	\$4,197,000
<i>Processing Related Totals</i>				
Processors	\$3,753,000	\$250,000	\$195,000	\$4,577,000
Processor Employees	1,029,000	45,000	0	1,035,000
Processing Support Businesses	437,000	37,000	0	1,363,000
Fish Tax Revenue	346,000	23,000	27,000	244,000
Subtotal	\$5,565,000	\$356,000	\$222,000	\$7,220,000
Grand Total	\$16,796,000	\$1,112,000	\$2,026,000	\$11,416,000

Table S-4 (continued)

<i>Harvest-related Totals</i>	Troll	Groundfish	King Crab	Totals
Permit Holders	\$561,000	\$486,000	\$198,000	\$12,060,000
Vessel Crew	42,000	150,000	94,000	5,058,000
Harvest Support Business	0	90,000	35,000	2,526,000
Subtotal	\$603,000	\$726,000	\$327,000	\$19,644,000
<i>Processing Related Totals</i>				
Processors	\$144,000	\$924,000	\$96,000	\$9,939,000
Processor Employees	0	231,000	22,000	2,362,000
Processing Support Businesses	0	102,000	11,000	1,951,000
Fish Tax Revenue	18,000	22,000	10,000	691,000
Subtotal	\$162,000	\$1,280,000	\$138,000	\$14,943,000
Grand Total	\$765,000	\$2,006,000	\$466,000	\$34,587,000

Note: Subtotals may not add to totals due to rounding.

Other Losses to Local Economies

In addition to the losses presented above, there may be other losses associated with reduced circulation of money earned in the Glacier Bay fisheries through local economies (the so-called indirect or multiplier effects). The present value of these indirect losses could total between \$3 million and \$5 million for all affected communities combined, or more, depending on the discount rate and assumptions made about the re-distributional effects of compensation money (see Chapter VIII).

Potential Economic Benefits of a Marine Reserve

Long-term, potential economic benefits stemming from the conversion of Glacier Bay from a productive commercial fishing area to a marine reserve have not been quantified in this study. To the extent that resident fish populations move to (or through) waters outside Glacier Bay, or to the extent that local populations produce off-spring that migrate outside the Bay, economic benefits could stem from increased local population abundance and increased reproductive success. The economic and other benefits associated with the creation of marine reserves elsewhere in the U.S. is the topic of extensive, on-going research. Though it is possible that in the long-term Southeast Alaska's commercial fishing industry could benefit from conversion of Glacier Bay to a marine reserve, such benefits are too speculative to attempt to quantify in this study.

Lifestyle-related Costs

This study does not attempt to measure lifestyle or opportunity costs associated with closing Glacier Bay to commercial fishing. The study team received numerous comments from fishermen and others about how the value of fishing in Glacier Bay goes beyond the dollar value of the fish harvested from the Bay. While these are very valid concerns, placing a dollar value on lifestyle or opportunity costs was not included in the scope of work for this assessment.

Summary

This economic assessment concludes that the present value of predicted losses stemming from commercial fishing closures and restrictions in Glacier Bay totals approximately \$23 million to \$40 million, depending on the discount rate used (different assumptions about losses in the halibut fishery could also push total losses above this range).² These totals include direct losses (to fishermen, crew, processors, employees and support businesses) as well as indirect losses to local economies. These estimates also implicitly include losses in capital asset values associated with Glacier Bay commercial fishing restrictions.

It is critically important to recognize the uncertainty associated with these estimates. Data limitations regarding past harvests in Glacier Bay, unforeseen management reactions to Glacier Bay closures, the future condition of fish stocks, and many other factors all contribute to this uncertainty. Any use of the findings of this study, including in the development of the compensation plan, must recognize the limitations of the estimates.

² This includes approximately \$20 million to \$35 million in direct losses and \$3 million to \$5 million in indirect losses). If the worst case is assumed in the halibut fishery, losses could total between \$33 million and \$59 million (depending on the discount rate used), including indirect impacts.

Comparison with the State of Alaska Economic Assessment

The State of Alaska's analysis of lost income due to commercial fishing closures and restrictions in Glacier Bay found that losses would total between \$16 million to \$23 million.³ Considering that compensation money already set aside was based on the State's estimate, it is important to recognize the differences between that study and the McDowell Group's assessment of losses. Following are the key differences between the two studies:

- The state study excluded losses to non-Alaska resident crew and processing employees.
- The state study was based on complete closure of all fisheries after 15 years rather than the lifetime access program.
- The state study predicted no crew losses in the halibut and troll fisheries.
- The state study predicted no processor losses in the halibut, troll or groundfish fisheries.
- With the exception of Dungeness processors, losses to processors in the State study were based on estimated lost net profits, rather than lost marginal profits.
- The state study did not include an assessment of losses in the king crab fishery.
- The state's estimate of compensation requirements included \$700,000 in administrative costs.
- The state's assessment included \$3.4 million in "transaction costs" (costs associated with imperfections in the application of the compensation program).

Table S-5

State of Alaska Estimates of Glacier Bay-Related Losses

	Tanner	Halibut	Dungeness	Troll	Other	Total
Harvestors	\$2,787,627	1,692,830	589,161	1,062,367	144,639	6,276,624
Crew	2,230,102	0	942,657	0	57,856	3,230,615
Processors	1,339,433	0	4,524,755	0	0	5,864,188
Employees	2,410,980	0	45,248	0	0	2,456,228
Raw Fish Tax	334,515	0	282,797	0	17,357	634,669
Subtotal	\$9,102,657	1,692,830	6,384,618	1,062,367	219,852	\$18,462,324
Support Sector	268,352	0	1,578,130	0	0	1,846,482
Less						
Non-Alaska crew						807,654
Total	\$9,371,009	1,692,830	7,962,748	1,062,367	219,852	19,501,152
Plus						
Transactions Costs						3,530,934
Program Admin.						500,000
ADFG Admin.						170,000
Grand Total						\$23,702,086

³ Jeff Hartman, *A Preliminary Estimate of Losses Associated with Commercial Fishing Phase out at Glacier Bay*. Alaska Department of Fish and Game, March 16, 1999.

The Next Step

The next phase in the Glacier Bay Compensation Plan will include the development of a compensation framework, including specific eligibility criteria. The National Park Service will – with the concurrence of the state of Alaska – determine eligibility criteria, define a compensation framework, and write the compensation plan.

It is important to understand what role this economic assessment will play in the development of the compensation plan. First, this assessment informs the NPS and others about how, operationally, closing Glacier Bay to commercial fishing could impact commercial fishermen, processors and others. Second, this assessment provides NPS and others with estimates of total collective financial losses, and the distribution of those losses, among fishermen, crew, processors, employees and others. Third, based on the distribution of losses among affected groups, this assessment serves as a guide in the development of a compensation framework and reasonable, understandable and equitable eligibility criteria.

It is also important to understand what this economic assessment does not do. Most important, it does not measure losses to individual people, businesses or communities. This assessment addresses only collective losses. This assessment does not presuppose or suggest any particular eligibility criteria or formulas for establishing losses to individuals. In fact, the formulas used in this assessment may not be appropriate for any particular fishing or processing operation. Because of the uncertainty associated with predicting future losses, and because it measures only collective losses, this economic assessment can only guide – not define – the compensation framework and eligibility criteria.

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Subsistence and commercial fishermen have been fishing in the waters of Glacier Bay since long before the U.S. government declared the area a national monument in 1925. In the late 1700s, European explorers observed Southeast Alaska's Tlingit people fishing in the Glacier Bay area. The first commercial fisheries began in the 1880s.

Commercial fishing has been a controversial issue in the national park since Congress designated some marine waters as wilderness in 1980. The Wilderness Act precludes most forms of commercial activity in designated wilderness, and NPS regulations preclude commercial fishing in National Park areas absent congressional authorization. An environmental group sued the National Park Service (NPS) in 1990 to close Glacier Bay to commercial fishing. A federal court subsequently ruled in 1994 that the Wilderness Act prohibits commercial fishing in park wilderness waters. The court also said the NPS has authority to regulate fishing in non-wilderness waters.

In 1991, NPS proposed regulations that would have phased out commercial fishing in the park after seven years. In 1997, NPS proposed new regulations that would have restated the wilderness closure, phased out commercial fishing in Glacier Bay proper over a 15-year period and allowed existing commercial fisheries to continue in park waters outside of Glacier Bay proper.

Congressional Action

In 1998, Congress passed legislation phasing out commercial fishing in Glacier Bay (Public Law 105-277, Section 123). The Act closed commercial fishing in wilderness and certain non-wilderness waters, phasing it out entirely as lifetime permit holders retire from the commercial salmon, halibut and Tanner crab fisheries. All other commercial fisheries, including the Dungeness crab fishery, were prohibited in Glacier Bay proper. The law established a buyout program for Dungeness fishermen meeting certain eligibility criteria, and authorized up to \$5 million in funding to implement the buyout program. Park waters outside Glacier Bay proper, where about 80 percent of commercial fishing has historically taken place, will remain open to fishing, subject to a State/federal cooperative fisheries management plan.

Congress amended the 1998 law in May 1999 (Public Law 106-31, Section 501). This amendment, in part, authorized up to \$23 million to "fairly compensate United States fish processors, fishing vessel crew members, communities and others negatively affected by restrictions on fishing in Glacier Bay National Park." The NPS is developing this compensation program, with concurrence of the State of Alaska. The amendment also authorized an additional \$3 million in funding to complete the buyout program for Dungeness crab fishermen meeting the eligibility criteria. To date this buyout program has been largely completed by NPS.

Public Involvement and Research

The current task is to measure the economic losses that will result from commercial fishing closures and restrictions, and determine how compensation money should be allocated and who will be compensated. Congress directed the NPS, with concurrence of the State of Alaska, to develop the compensation program. The Park Service hired RESOLVE, a non-profit, neutral mediation organization, to assist in implementing a comprehensive public process that would involve those affected by the fishing closures. This includes an assessment of the economic impact of the Glacier Bay fishing restrictions. The McDowell Group, Inc., of Juneau, was selected to conduct the economic assessment.

The McDowell Group study team, the National Park Service and Alaska Department of Fish & Game officials held meetings throughout northern Southeast Alaska in January and February to talk with fishermen and others about their economic losses, and to hear their ideas for distributing \$23 million in federal compensation funds.

Congress did not set criteria for disbursing the \$23 million. Public involvement is a key element in developing a fair distribution program. Numerous fishermen, crewmembers, fish processors, community and Native leaders attended the winter meetings, that were held in Juneau, Haines, Gustavus, Pelican, Hoonah, Wrangell, Petersburg, Sitka and Kake. While those who attended discussed their personal financial losses, they also had concerns about the broader impact of closing off the Bay to fishing. Among other concerns, these include retaining their opportunity to fish, the displacement of fishermen which results in the crowding of other fisheries, and using the compensation money to benefit the fishing industry as a whole. A written summary of the open house meetings is available from the National Park Service.⁴

The Closures

After Oct. 1, 2000, only Tanner crab, troll salmon and halibut fishermen who meet the requirements for a Lifetime Access Permit (LAP) will be allowed to fish in Glacier Bay proper. Commercial fishing in the Bay will close completely when the last of the lifetime permit holders retires several decades hence. The National Park Service will accept applications for lifetime permits until Oct. 1. To qualify, Tanner crab fishermen and salmon trollers must have made landings from Glacier Bay proper in at least three of the years between 1989 and 1998. Halibut fishermen must have made landings in the Bay proper in at least two of the years between 1992 and 1998. Glacier Bay proper is defined as the waters north of a line from Point Carolus to Point Gustavus.

The National Park Service is now enforcing commercial fishing closures in:

- All wilderness-designated waters in Glacier Bay National Park. These include the Beardslee Islands, Rendu Inlet, Adams Inlet, the Hugh Miller Inlet/Scidmore Bay/Charpentier Inlet complex, and upper Dundas Bay.
- Geike Inlet

⁴ Copies of the open house summary are available through the National Park Service at 877-886-8831 (toll free) or on the web at www.nps.gov/glba.

- West Arm of Glacier Bay proper, north of 58 degrees, 50 minutes north latitude. Trolling for king salmon will be allowed from Oct. 1 through April 30. Johns Hopkins, Tarr and Reid inlets in the West Arm remain closed to all commercial fishing.
- East Arm of Glacier Bay proper, north of a line drawn from Point Caroline through the Southern end of Garforth Island, to the east side of Muir Inlet. From Oct. 1 through April 30, king salmon trolling will be allowed south of a line across Muir Inlet at the southern most point of Adams Inlet.

The purpose of this study is to measure the economic impact of these closures and restrictions on commercial fishing in Glacier Bay on fishermen, crew, processors, support businesses, and communities.

Scope

This analysis predicts potential and actual losses to fishermen, processors and others directly or indirectly involved in the following commercial fisheries in Glacier Bay:

- Tanner crab (pot and ring)
- Dungeness crab
- Power and hand troll (salmon)
- Halibut longline
- King crab
- Groundfish.

Within each of these fisheries, potential losses to the following groups are considered:

- Permit holders
- Crew
- Processors
- Processor employees
- Businesses providing goods and services to fishermen and processors
- Communities receiving raw fish taxes and experiencing other indirect benefits associated with commercial fishing in Glacier Bay.

Collective, or total, losses are estimated for each of these groups. The analysis does not measure losses for any single fisherman or business.

Methodology

The first step in calculating losses within each fishery was to identify the historical harvest in Glacier Bay, including the harvest from areas now entirely closed to commercial fishing and those areas that will remain open to permit holders with lifetime access. In general, ten years of harvest data was used to establish a baseline. Though in some cases harvest data was available for earlier years, the period of 1989 to 1998 was used to establish the annual average harvest from Glacier Bay. Though somewhat subjective, selection of the ten-year period was based on several considerations. First, compared to a shorter baseline period, a ten-year baseline more accurately captures the market and resource cycles that influence the volume and value of fish harvested from Glacier Bay. Second, compared to a longer baseline period, a ten-year baseline more accurately captures changes in the value of the fisheries associated with changes in resource management, such as IFQs, and broad structural changes in seafood markets. Finally, in some cases, availability of data

dictated the time period used to establish the baseline. The specific time period used for each fishery is provided in the following detailed analyses of losses in each fishery.

The values to fishermen and processors of past income and future losses are expressed in 1999 dollars. All past harvest values are adjusted to 1999 dollars using the Anchorage Consumer Price Index (CPI) – All Items. Rather than the Producer Price Index, which measures price changes for very broad categories of goods sold in primary markets, the CPI is the best data available to calculate the real final value of Glacier Bay harvests to fishermen, processors and others.

A key assumption in this analysis is that historical harvest levels fairly represent the volume and value of future harvests from Glacier Bay. Ultimately, international market trends, resource management considerations and other factors would determine the volume and value of future Glacier Bay harvests. However, incorporating such unpredictable factors in this analysis is beyond the scope of the study and, in any case, would probably not improve the accuracy of the outcome of the analysis (particularly given the unpredictable nature of seafood markets). In summary, past harvests are considered the best available proxy for future harvests had commercial fishing in Glacier Bay remained unrestricted.

The Commercial Fisheries Entry Commission (CFEC) provided data on historical harvest volumes and values. Again, data availability and limitations varied from fishery to fishery. CFEC was able to provide detailed historical harvest data for the Tanner crab harvest in areas now closed (except for the Beardslee Islands) as well as areas remaining open to fishermen with lifetime access permits. Power troll and hand troll harvest data is available for Area 11400 only, an area that includes productive trolling grounds outside Glacier Bay. Halibut harvest data is available for Glacier Bay proper (Area 184), but only from 1992 to 1998. Groundfish harvest data is available for Area 365830, an area that includes most but not all of Glacier Bay. Additional data limitations are discussed below.

Methodology issues associated with calculating potential losses for each of the specific groups considered in this study are discussed elsewhere in this report.

Potential Losses to Permit Holders

Potential losses to permit holders are based on estimates of foregone profits associated with the decline in the Glacier Bay harvest. These losses include the immediate loss of certain Wilderness and non-Wilderness waters that are now closed to all commercial fishing. These also include losses associated with the gradual, long-term decline in the harvest from waters of the Bay that remain open to lifetime access permit holders.

An important consideration in measuring losses to permit holders, crew, processors and others associated with commercial fishing in Glacier Bay

1 is the rate at which lifetime access fishermen retire or die and,
2 accordingly, how rapidly the harvest from open areas of the Bay declines.
3 Though many factors will determine the fishing effort and harvest from
4 the Bay in future years, for purposes of this study it is assumed that the
5 harvest (in all fisheries) will decline at about the same rate as lifetime
6 access fishermen retire from the fishery. National data on the average age
7 of retirement was used to model the rate of decline in fishing effort and
8 harvest in those areas of Glacier Bay open to lifetime access fishermen.⁵
9 Though adequate for this analysis, retirement rate data is not ideal for
10 this application. As lifetime access permit holders retire from the fishery,
11 remaining fishermen will enjoy reduced competition for Glacier Bay fish.
12 Theoretically, a handful of fishermen will eventually have exclusive
13 access to Glacier Bay and harvest the same volume of fish now taken by a
14 much larger number of fishermen. Therefore, it is possible that the
15 harvest declines will be more abrupt than gradual. To the extent that is
16 true, using average retirement rates to predict the Glacier Bay harvest
17 decline may result in a slight overstatement of potential losses (because
18 the farther into the future the loss occurs, the smaller the present value of
19 that loss). On the other hand, national retirement data, which includes all
20 occupations, probably reflects a higher average age of retirement than
21 actually occurs in the physically demanding commercial fishing industry.

22
23 Potential losses to permit holders are measured in terms of foregone
24 marginal profit. More specifically, certain variable costs including crew
25 shares, fuel, food and bait, are subtracted from the predicted annual ex-
26 vessel value of the harvest to estimate foregone annual marginal profit
27 (ex-vessel value is the dollar amount paid to fishermen for their harvest).
28 Cost data for the commercial fisheries were compiled from several
29 sources, including key informants and past McDowell Group research.⁶

30
31 Total collective losses suffered by permit holders could be distributed
32 among three groups, including:

- 33
34 • permit holders with a history of fishing in Glacier Bay but not
35 qualifying for lifetime access
36 • permit holders qualifying for lifetime access
37 • all other permit holders in the fishery.
38

39 Each of these groups is affected in different ways, as described below.
40

41 **Losses to permit holders with a history of fishing in Glacier Bay but**
42 **not qualifying for lifetime access**
43

44 These permit holders can no longer fish in the Bay. It is true that
45 fishermen are mobile and, if displaced, theoretically may be able to

⁵ According to Bureau of Labor Statistics (BLS) data, the average retirement age for U.S. males is 62 years. To model retirement around the mean, the study team assumed a normal distribution around the mean. The average age of permit holders qualifying for lifetime access is 48 years for Tanner pot fishermen, 41.5 years for Tanner ring, 51 years for halibut, 50 years for hand troll and 52 years for power troll.

⁶ McDowell Group, Inc., *Alaska Seafood Industry Study, Technical Report: An Economic Profile of the Seafood Industry in Alaska*. Prepared for the Alaska Seafood Industry Study Commission, Anchorage, Alaska, 1989.

1 replace at least some of their lost harvest. However, the nature of
2 commercial fishing justifies the assumption that displacement in this case
3 has real costs. In commercial fishing, experience is critical. Intimate
4 knowledge of fishing grounds, the contours of the sea floor, the currents
5 and tidal actions, and habits of the fish under certain climatic conditions
6 in certain areas, for example, are all critical factors for successful and
7 profitable commercial fishing. Pushing fishermen out of familiar grounds
8 may force them into less productive and perhaps unfamiliar areas. All
9 these factors mean more time and money spent to catch a volume of fish
10 equal to or less than the volume of fish historically harvested from
11 Glacier Bay.
12

13 On the other hand, historical profit from the Glacier Bay harvest does not
14 necessarily represent future losses associated with loss of access to
15 Glacier Bay. These fishermen (with certain exceptions) can fish outside
16 the Bay and to varying degrees substitute their lost Glacier Bay harvest
17 with fish caught in other areas – at the expense of fishermen already in
18 these other areas. However, the fact that these permit holders did not
19 qualify for a lifetime access permit would suggest that they were either
20 new to the fishery and/or have other areas outside Glacier Bay that are
21 routinely fished.
22

23 **Potential Losses to permit holders qualifying for lifetime access**

24
25 In spite of being granted lifetime access to Glacier Bay, these permit
26 holders could also suffer financial losses due to loss of productive fishing
27 grounds. Certain areas (Wilderness and non-Wilderness waters) within
28 Glacier Bay are now closed to all commercial fishing, including lifetime
29 access permit holders. Some of these Wilderness areas have been
30 productive fishing grounds. Lifetime access permit holders that have
31 traditionally fished in these areas will be forced to fish elsewhere (either
32 within open areas of Glacier Bay or outside the Bay). Realistically these
33 fishermen could be expected to incur increased costs and reduced
34 profitability as they seek to replace the harvest they formerly took from
35 the now-closed areas. It is also true that in the future the last remaining
36 lifetime access permit holders could enjoy the benefits of nearly exclusive
37 access to Glacier Bay.
38

39 **Potential losses to all other permit holders in the fishery**

40
41 In certain fisheries, especially the Tanner crab fishery (and perhaps also in
42 the Dungeness fishery), fishermen who have never fished in Glacier Bay
43 could suffer financial losses as a result of closures and restrictions in
44 Glacier Bay. Fishermen excluded from Glacier Bay will shift their fishing
45 efforts to areas outside the Bay, increasing fishing effort and competition
46 in the region's other productive Tanner grounds (termed "dislocation
47 effects"). Further, as the permits held by fishermen with lifetime access to
48 Glacier Bay are sold or transferred to fishermen without access to the Bay,
49 competition will increase in areas outside the Bay. This increased
50 competition for a limited resource could mean lower profits for everyone
51 in the fishery.
52

1 The study team spent significant time attempting to predict the
2 distribution of losses among these three groups of permit holders.
3 However, predicting the financial consequences of dislocation effects
4 requires far too much speculation to be satisfactorily addressed in this
5 economic assessment. Because of the subjective nature of this particular
6 issue, the study team determined that the process of distributing losses
7 among the three groups of permit holders within a particular fishery is
8 best handled within the compensation-planning phase of this project.
9

10 **Key Assumptions in Predicting Losses to Permit Holders**

11
12 The first measure of losses in all Glacier Bay fisheries is based on the total
13 value of Glacier Bay harvest, irrespective of fishermen's collective ability
14 to replace the Glacier Bay harvest with fish taken in other waters. These
15 are termed "potential" losses. For reasons described in this report, this
16 potential-loss measure accurately reflects actual losses that will be
17 suffered by present and future participants in certain fisheries, but not in
18 others. For these fisheries, alternative measures of losses are discussed in
19 the following chapters.
20
21

22 **Potential Crew Losses**

23
24 Potential losses to crew are measured as a percentage of the overall
25 decline in the harvest associated with closures and restrictions in Glacier
26 Bay. For example, historically, approximately 30 percent of the ex-vessel
27 value of the Tanner harvest has been paid out as crew shares, based on
28 standard crew-share practices in the Tanner pot fishery. As the Glacier
29 Bay harvest declines over time, total annual crew losses will equal 30
30 percent of the annual ex-vessel value of the lost harvest.
31

32 Similarly, potential crew losses in the Dungeness fishery are assumed to
33 equal approximately 15 percent (the Dungeness fishery norm for crew
34 shares) of the historical average annual ex-vessel value of the Glacier Bay
35 harvest. Potential crew losses in the salmon, halibut and groundfish
36 fisheries are addressed in the same way.
37

38 Actual crew losses may be less than potential losses in some fisheries. In
39 fisheries where resource abundance is such that full replacement of the
40 lost Glacier Bay harvest is considered possible through harvest in other
41 waters, crew losses will be less than potential losses. This issue is
42 addressed on a fishery-by-fishery basis in following chapters.
43

44 This analysis does not distinguish between individual crewmen who may
45 be affected in very different ways by fishing restrictions in Glacier Bay.
46 For example, some Dungeness crew may no longer have a job, if their
47 skipper was bought out. Other Dungeness crew who formerly fished in
48 Glacier Bay may still have jobs but are forced, along with their skipper, to
49 fish elsewhere in Southeast. Still other Dungeness crew may suffer only
50 from increased competition as a result of dislocated Glacier Bay
51 fishermen move into their waters. Developing criteria for compensating
52 crew for this broad range of impacts will be addressed in the next phase
53 of the Glacier Bay Compensation Plan.

No distinction between Alaskan and non-resident crew is made in this analysis.

Specific assumptions about crew losses in each fishery are discussed in following sections of this report.

Potential Losses to Processors

Potential losses to processors are also based on estimates of lost marginal profits. The model is somewhat different than that used to calculate potential losses to permit holders in that marginal profit is measured on a cents-per-net-pound basis rather than as a percent of ex-vessel value.

The difference between marginal profit and net profit is that in measuring marginal profit only variable costs are subtracted from gross revenue. In measuring net profit, variable and fixed costs are subtracted from gross revenue. Estimating lost marginal profits is the most appropriate methodology for measuring losses associated with commercial fishing closures and restrictions in Glacier Bay. Processors affected by Glacier Bay closures will remain in business (with one or two possible exceptions) despite the closures. Their loss occurs at the margin, meaning that once the plant is operational, all fixed costs incurred, and at least a break-even level of production established, each additional pound of product sold represents profit to the company, after subtracting variable costs associated with handling that pound of product. For most processors affected by Bay closure, the loss occurs at the margin. If a processing plant actually fails because of Glacier Bay closures, losses would be best measured on a net-profit basis on the entire business, not just that portion of the business relying on Glacier Bay-caught fish.

To measure total potential losses to processors, marginal profit estimates were made for each of the seafood products produced from the Glacier Bay harvest. The study team based these estimates on information provided by processors operating in northern Southeast Alaska. The study team cross-checked the data provided by processors with wholesale value data available from ADF&G. The marginal profit estimates made in this study represent average values for all processors producing a particular product from Glacier Bay. The estimates may or may not accurately reflect marginal profit for any individual processor. Further, utilization of these margins in this analysis in no way suggests that the loss to any individual processor can or should be measured by these margins. Every processor in the region operates with different margins. In calculating losses, individual marginal profits should be used, not the average for all processors combined. Again, the average marginal revenue estimates used here are only useful in measuring collective or total losses, not individual losses.

Estimated marginal profit does not provide all of the information needed to estimate losses to processors of Glacier Bay fish. The volume of product is, of course, the second critical piece of data needed to calculate potential losses. With data on the total net, or finished, weight of Glacier Bay product unavailable, the study team first converted the data on

1 marginal profit, cents-per-net-pound basis, to marginal profit on cents-
2 per-gross-pound or round weight basis. This marginal profit data could
3 then be applied to the harvest data available from CFEC, providing the
4 estimated total losses to processors of Glacier Bay fish and crab.
5

6 Specific data on marginal profits and recovery rates for Glacier Bay
7 seafood products are provided in following sections of this report.
8

9 Actual processor losses may be less than potential losses in some
10 fisheries. In fisheries where resource abundance is such that partial or
11 full replacement of the lost Glacier Bay harvest is possible through
12 harvest in other waters, processor losses will be less than potential losses.
13 This issue is addressed on a fishery-by-fishery basis in following
14 chapters.
15
16

17 **Potential Losses to Processor Employees**

18

19 Labor cost data was also collected from processors, again on a cents-per-
20 net-pound basis. This data was converted to a cents per-gross-pound
21 basis and used to estimate total potential losses to employees. For
22 example, if labor costs associated with production of product "AA" is 10
23 cents per net pound, and the recovery rate for that product is 60 percent,
24 labor cost on a cents-per-gross-pound basis is 6 cents per pound. For
25 example, if 100,000 pounds (gross) of the Glacier Bay Tanner harvest is
26 sold as product AA, processing labor costs would total \$6,000. As the
27 Glacier Bay Tanner harvest phases out and eventually is eliminated
28 entirely, annual losses to processor employees will reach \$6,000.
29
30

31 **Potential Losses to Support Businesses**

32

33 Potential losses to businesses providing goods and services to fishermen
34 are based on assumptions about the percentage of gross revenue that is
35 spent on variable costs and estimates of the percentage of these
36 expenditures that are spent locally.
37

38 Potential losses to businesses providing goods and services to processors
39 are based on variable cost data provided by processors. This data, which
40 was provided on a cents-per-net-pound basis, was converted to a cents-
41 per-gross-pound basis. Again, by estimating the percentage of these
42 expenditures that are spent locally it is possible to predict the decline in
43 local spending that will occur as the Glacier Bay harvest declines.
44
45

46 **Potential Losses to Communities**

47

48 Losses to communities are divided into two categories. The first category
49 is lost raw fish tax revenues. The second category includes losses that are
50 much more difficult to quantify, including potential secondary and
51 tertiary economic (multiplier) losses not measured in the support
52 business analysis described above, and other indirect impacts. The study

team's approach to estimating these indirect losses is discussed in detail in Chapter VIII, "Indirect Losses to Communities."

To compare the relative impacts of Glacier Bay fishing restrictions and closures on communities, place of residence data for Glacier Bay fishermen was sorted and tabulated by community. While this information does not provide an absolute measure of the economic impact of Bay closures on communities, it does indicate where affected fishermen live and which communities could suffer some measurable economic dislocation.

Limitations of the Analysis

To measure the economic impacts of commercial fishing restrictions and closures in Glacier Bay, a number of important assumptions have been made. These include assumptions about:

- The accuracy of CFEC data on harvests in Glacier Bay (fishermen fishing in more than one statistical area may have either under-reported or over-reported their harvest in the area where the fish were actually caught).
- The actual harvest of Tanner crab, halibut and salmon from areas now closed.
- The rate at which the harvest in Glacier Bay declines as a result of attrition among lifetime-access fishermen.

Perhaps the most important assumption is that past fishing and processing activity accurately represent future fishing and processing activity in Glacier Bay. Given the dynamic nature of fish stocks, management strategies, and seafood markets, the assumption is by no means clear-cut. Still, using the historical harvest as a proxy for the future is the only real option available to the study team, given the time available to conduct this study.

Potential Capital Asset Losses

Reduced harvests from Glacier Bay could reduce the value of capital assets invested in commercial fisheries, certainly locally, and even region-wide. For example, the value of Dungeness processing investments in Gustavus, Hoonah and Pelican have declined as a result of Glacier Bay closure. Unless processors are able to purchase crab harvested from other grounds, the value of these investments is lost.

The Tanner crab fishery serves as an example of potential region-wide capital losses. Over the past ten years, Glacier Bay has accounted for about 10 percent of the total Southeast Alaska Tanner crab harvest. Eventually, the Tanner crab harvest from Glacier Bay will decline to zero and as that decline occurs, the ADF&G will reduce the guideline harvest level (GHL) for Tanner. Eventually (and all other factors being equal) the Southeast GHL will be reduced by 10 percent. If the Southeast Tanner fishery were a "price setter" (meaning that if the price of product

increased as the volume harvested declined), this reduction in the GHL would not reduce the profitability of the fishery. But the Southeast Tanner fishery is predominantly a “price taker,” being subject to prices determined largely by the status of the Bering Sea Opilio harvest. As such, as the GHL declines, so too does the profitability of the Southeast Tanner fishery. Again, all other market and resource forces held constant, the profitability of the Southeast Tanner fishery will over time decline by 10 percent. This reduced profitability is theoretically reflected in the value of permits and other capital assets invested in the fishery. In the Tanner fishery, the decline in permit values could eventually reach 10 percent.

While the loss in value of capital assets is very real, the study team has not attempted to measure these losses. This economic assessment measures future income that would have been generated in the Glacier Bay commercial fisheries. Measuring both capital investment and future income in the Glacier Bay commercial fisheries would be measuring the same loss twice.

To understand this concept, consider an investment in a commercial fishing boat or a seafood processing plant. This investment is made with the expectation that it will generate a monetary return – it will generate income over time. If government takes some action that makes it impossible to generate income from that investment, the government can compensate people in one of two ways, it can offer to replace the income that the investment would have generated, or it can replace the original investment, but not both.

For example, assume a Gustavus processor invests \$100,000 in a plant to process Glacier Bay Dungeness. Further assume that investment is generating \$25,000 a year in profits. Then, the government closes Dungeness crab fishing in Glacier Bay. The government can compensate that processor by either giving him the present value of future annual profits of \$25,000, or it can give him his \$100,000 initial investment, *but not both*. Theoretically, the value of the initial investment and the present value of future profits are equal.

If the government does pay the processor both the initial investment and future profits, he’s being compensated twice for the same loss. The processor not only is given the present value of all future profits on the investment, he’s also given his initial investment back, which he can reinvest and earn more profit.

Returning to the example, the Dungeness processor will be compensated for his lost future income. The value of his investment will go down, but he’s being compensated as if it were fully functional and generating profits far into the future – even though its closed. The full value of that initial \$100,000 investment is still being realized in terms of payment of future profits. If he chooses to sell the processing facility, even if he sells it at a loss, he’s experiencing a net benefit from the sale because his compensation is based on the assumption that it would generate profits far into the future.

Summary

This analysis provides estimates of total potential and actual economic losses (not individual losses) associated with commercial fishing restrictions and closures in Glacier Bay. It measures all *future* losses – losses in perpetuity – suffered by present and future participants in Glacier Bay commercial fisheries. In considering losses to current participants only, specific eligibility criteria must be established as well as decisions made about how far into the future losses for current participants should be carried – whether individual, corporate or community losses. These issues will be addressed in the second phase of the Glacier Bay Compensation Plan.

All future losses predicted in this study are discounted to a present value. Discounting is required to find the equivalent value today of money receivable or payable in the future. In other words, because of the time value of money, an amount owed or receivable in the future has less value today.

Determining the discount rate (the interest rate used to reduce future money to a present value) best suited for this type of analysis is somewhat subjective. One appropriate measure for discounting future cash flow for any given business is the cost of capital for that business. The cost of capital for any particular business is a blend of the cost of borrowing and the cost of reinvesting earnings (generally reflected as an opportunity cost – the cost of a safe investment for those earnings). All other factors being equal, the higher the financial risk associated with the business, the higher the cost of capital, and the higher the discount rate.

The cost of borrowed money for participants in the commercial fishing industry is reflected in loan programs available to fishermen. Alaska fishermen can secure loans from the Commercial Fisheries and Agriculture Bank (CFAB) and the Alaska Department of Community and Economic Development's (DCED) commercial fishing loan program. CFAB rates depend on the financial condition of the borrower, but is currently charging approximately 11 percent on vessel loans and 9.5 percent on permit loans. DCED charges 2 percent above prime, not to exceed 10.5 percent, for loans on vessels. Between 1989 and 1998 DCED loan rates averaged 9.8 percent.

Long-term U.S. government bond rates provide a reasonable estimate of the cost of reinvested capital. Between 1989 and 1998, long-term treasury bonds (maturity of ten or more years) averaged 7.3 percent.⁷

After adjusting for inflation (which averaged 3.27 percent between 1989 and 1998, based on the U.S. Consumer Price Index), the real cost of borrowed and reinvested capital for the 1989 to 1998 period was 6.57 percent and 4.03 percent, respectively (data supporting these calculations are provided in the appendix). If it is assumed that borrowed money and

⁷ U.S. Federal Reserve, <http://www.federalreserve.gov/>

1 reinvestment contribute equally to the fishermen's cost of capital, the
2 average cost of capital during the 1989-98 period was 5.3 percent.
3

4 A discount rate used in this study to reduce future losses to a present
5 value is 5.3 percent. Though this discount rate is based on interest and
6 inflation rates for a ten-year period only (1989-98), it is generally
7 equivalent to average discount rates over much longer periods of time.⁸
8

9 The only previous investigation of discount rates in the commercial
10 fishing industry identified by the study team was published in the
11 Canadian Journal of Fisheries and Aquatic Sciences in 1984.⁹ That work
12 measured a "risk premium" associated with investments in limited entry
13 permits to be 5.5 percent. The data supporting that conclusion, however,
14 is from a limited and dated period of time (1976 through 1981) and
15 therefore has limited applicability for this study.
16

17 A discount rate equal to the cost of capital is one rational rate for
18 calculating the present value of future losses suffered by individuals now
19 involved in the fisheries. However, it may not be the best rate for
20 measuring collective or societal losses. For example, the National Park
21 Service, recommends using a 3 percent discount rate in its analysis of
22 social policy.¹⁰ The State of Alaska, in its assessment of losses associated
23 with closing Glacier Bay to commercial fishing, used a 3 percent discount
24 rate. For measuring present and future collective losses to the industry,
25 communities and the state of Alaska, a lower, "social" discount rate is
26 more appropriate.¹¹
27

28 In summary, there is no generally accepted discount rate to use in this
29 type of analysis. Discount rates are sometimes negotiated, as in the
30 Dungeness crab buy-out program (where a 2.56 percent discount rate was
31 used). In this assessment, present values are calculated using 3.0 percent
32 and 5.3 percent discount rates.
33

34 It should be noted that higher discount rates result in lower net present
35 values, or conversely, lower discount rates result in higher net present
36 values. It is important to note, however, that changing the discount rate
37 does not change the relative distribution of future losses among the
38 affected groups.
39
40
41

⁸ The average real (inflation-adjusted) prime rate during the 1989-98 period was 4.99 percent. The 20-year average prime rate was 5.63 percent, the 30-year average 4.09 percent and the 40-year average 3.8 percent. This data suggests that the 1989-98 period is not atypical in terms of interest and inflation rates.

⁹ Jonathan M. Karpoff, "Insights from the markets for Limited Entry Permits", *Canadian Journal of Fisheries and Aquatic Sciences*, Volume 41, Number 8, 1984.

¹⁰ Bruce Peacock, *The Appropriate Discount Rate for Social Policy Analysis: Discussion and Estimation*. US. Department of the Interior, Office of policy Analysis, Issue Paper 11/22/95.

¹¹ The social discount rate represents the rate at which society is willing to trade consumption between different time periods.

Chapter I. Losses in the Tanner Pot Fishery

Profile of the Fishery

There are five permit types that allow commercial access to the Tanner crab resource in Southeast Alaska. Four permit types are for pot fisheries, which were designated limited entry in 1984. There is one pot permit type specific to Tanner crab only and three permit types that allow access to Tanner and other crab species. Entry to the Tanner crab ring net fishery is not limited.

The Tanner crab pot fishery is a potentially lucrative, competitive fishery and participation is nearly 100 percent. In 1998, 95 pot permits were issued and 93 were fished.

Dedicated Tanner Crab Permits

- T10A (Tanner crab ring net). Entry is not limited to this fishery. In 1998, 139 permits were issued and 93 permits were fished with average ex-vessel earnings of \$1,665 per permit.
- T19A (Tanner crab pot gear). As of 1998, four permanent and eight interim permits were issued. All 12 permits were fished in 1998, with average ex-vessel earnings of \$44,627 per permit.

The Tanner crab ring net fishery is primarily a small-boat fishery with modest capital investment and production. Ring net fishermen accounted for half of permits fished in Southeast Alaska for Tanner crab in 1998 (93 of 186), but caught only 3 percent of the Southeast Tanner crab harvest that year, consistent with harvest rates throughout the 1990s.

Combination Permits

In recent years, Tanner crab has provided the bulk of value to holders of combination crab permits in Southeast Alaska. From 1991 through 1998, Tanner crab provided an average 79 percent of gross earnings for combination permits, ranging from 70 percent to 90 percent during the eight-year period.

Entry into the Tanner crab and king crab pot fisheries was limited in 1984. Fishermen were awarded the rights to catch multiple crab species based on their catch history for each species between 1975 and 1983, their investment in and economic dependence on the fishery and their consistency of participation during qualifying years.

- K49A (red king, blue king and Tanner crab pot gear). As of 1998, eight permanent and 20 interim permits were issued. Twenty-seven (27) permits were fished in 1998 with average ex-vessel earnings of \$52,378 per permit.
- K59A (brown king, Tanner crab pot gear). As of 1998, zero permanent and four interim permits were issued. Three permits were fished in 1998, but average earnings are not disclosable (state law prohibits

release of data when fewer than four fishermen participate in a fishery).

- K69A (brown king, blue king, red king and Tanner crab pot gear). As of 1998, 14 permanent and 37 interim permits were issued and all 51 permits were fished in 1998, average earnings \$72,957.

Interim use permits are a major issue in the Tanner crab fishery because they may be revoked at a future date. Of 95 Tanner pot permits issued in 1998, 61 permits (64 percent) are designated interim use. Many of these are under review for point totals related to a single species on a combination permit. However, some interim-use permits will likely be eliminated upon review. Considering that the fleet is fairly small and earnings are fairly high, eliminating even a small portion of the fleet will have a significant positive impact on the remainder. Conversely, fishermen with interim-use permits that may not survive a review have a vested interest in challenging such decisions and remaining in the fishery as long as possible.

Combination permits are non-severable, meaning that the harvesting rights for species designated on that card may not be split up and sold separately.

Historical Harvest in Glacier Bay

Between 1990 and 1998, the Tanner pot gear harvest from Glacier Bay has averaged 235,200 pounds (1989 data is non-disclosable). In 1999 dollars the harvest's value averaged \$586,000 annually. This data includes commercial Tanner crab landings where the permit fisheries were T19A, T10A, K49A, K59A, or K69A. Over the period 1990 through 1998, the Glacier Bay Tanner harvest (pot only) accounted for approximately 10 percent of the total Southeast pot harvest, ranging from 7 percent in 1991 to a high of 18 percent in 1997.

Table 1.1

Glacier Bay Tanner (Pot) Harvest Percent of Southeast Total, 1990 to 1998

Year	Total SE Pot Tanner Harvest (lbs)	Glacier Bay Harvest (lbs)	Percent of Southeast Total
1990	1,908,576	182,504	9.6%
1991	2,184,844	162,642	7.4%
1992	2,059,069	180,206	8.8%
1993	1,536,143	*	*
1994	1,964,380	194,870	9.9%
1995	2,433,571	278,344	11.4%
1996	1,969,435	274,277	13.9%
1997	1,818,884	322,243	17.7%
1998	2,615,043	286,442	11.0%
90-98 Ave	2,054,438	235,191	10.2%

Source: CFEC

*Data not available, average excludes 1993.

1
2 According to fish ticket data, 11 percent of the Glacier Bay harvest came
3 from waters that are now closed to commercial fishing. This includes the
4 harvest in areas 11460, 73-75, and 77. This understates the actual harvest
5 from closed areas, however, because the Beardslee Islands (which are
6 now closed) are included in area 11470. For purposes of this study, it has
7 been assumed that 10 percent of the historical harvest in Area 11470 has
8 come from the Beardslee Islands area. This estimate is based on log book
9 data provided by a number of active Glacier Bay fishermen.

10
11 CFEC data for the pot fishery indicates that 21 Tanner crab permit
12 holders may qualify for lifetime access. There are 31 permit holders with
13 Glacier Bay history (at least one fish ticket reported during the qualifying
14 years) who may not qualify for lifetime access. Lifetime access is defined
15 as landings/participation in three or more years from 1989-1998. No
16 access is defined as landings/participation in less than three years from
17 1989-1998. Over the ten-year period from 1989 to 1998, permit holders
18 qualifying for lifetime access have accounted for approximately 82
19 percent of the total Glacier Bay harvest.

Table 1.2

**Glacier Bay Tanner Harvest, Pot Gear
1990 to 1998
Areas 11460, 70-77**

Total Glacier Bay						
Year	Landings	Permits	Pounds	Value(\$)	Value (99\$)	
1990	20	12	182,504	\$365,008	\$457,337	
1991	18	11	162,642	243,963	292,362	
1992	24	15	180,206	394,477	457,248	
1993	*	*	*	*	*	
1994	22	12	194,870	475,483	523,577	
1995	30	20	278,344	1,060,491	1,134,958	
1996	29	20	274,277	578,999	602,938	
1997	29	24	322,243	634,819	651,478	
1998	22	18	286,442	561,426	568,698	
1990-98 Ave.	24	17	235,191	\$539,333	\$586,075	
Areas 11460, 73-77 (Closed Areas)**						
Year	Landings	Permits	Pounds	Value(\$)	Value (99\$)	
1990	7	4	21,972	\$43,944	\$55,060	
1991	4	2	24,503	36,755	44,046	
1992	5	4	35,472	77,649	90,005	
1993	*	*	*	*	*	
1994	6	4	15,414	37,610	41,414	
1995	9	7	24,662	93,962	100,560	
1996	6	4	11,512	24,302	25,307	
1997	6	6	39,511	77,837	79,879	
1998	4	4	33,043	64,764	65,603	
1990-98 Ave.	6	4	25,761	\$57,103	\$62,734	
Areas 11470, 71, 72 (Open Areas)***						
Year	Landings	Permits	Pounds	Value(\$)	Value (99\$)	
1990	13	8	160,532	\$321,064	\$402,277	
1991	14	9	138,139	207,209	248,316	
1992	19	11	144,734	316,827	367,243	
1993	22	14	133,804	244,861	275,446	
1994	16	8	179,456	437,873	482,163	
1995	21	13	253,682	966,528	1,034,398	
1996	23	16	262,765	554,697	577,631	
1997	23	18	282,732	556,982	571,599	
1998	18	14	253,399	496,662	503,095	
1990-98 Ave.	19	12	201,027	\$455,856	\$495,796	

Source: ADF&G Value estimates based on CFEC data.

* Data non-disclosable.

**Data includes the entire harvest from Dundas Bay (area 11460) while only the wilderness waters of Dundas Bay will be closed. However, data for Dundas Bay is non-disclosable. ADF&G personnel indicated that during the 1990-98 period there was "very little" commercial effort for Tanner crab in Dundas Bay.

*** Includes the Beardslee Islands, which are now closed.

Predicted Decline in Glacier Bay Harvest

The ex-vessel value of the Glacier Bay Tanner harvest is assumed to drop by approximately \$115,000 immediately (the entire harvest from closed areas and 10 percent of the harvest from area 11470), as a result of the loss of the closed areas. Based on predicted rates of retirement among permit holders with lifetime access, the harvest is expected to hold steady for about ten years then decline until about 2025, when the Glacier Bay harvest drops to zero. At that time, the ex-vessel loss will total approximately \$586,000 annually.

Financial Assumptions

Potential losses to permit holders, crew, processors and support business are based on the assumptions shown in Tables 1.3 and 1.4.

Table 1.3

Tanner Harvest (Pot) Financial Assumptions

	% of Gross Revenue
Variable Costs	
Crew	28.0%
Fuel/Bait/Food	10.0%
Other Variable Costs	3.0%
<i>Total Variable Costs</i>	41.0%
<i>Total Variable Costs Less Crew</i>	13.0%
Marginal Profit	59.0%
Estimated % of Variable Costs Spent Locally (excl. labor)	80%

These assumptions indicate potential crew losses account for 28 percent of the gross or ex-vessel value of the harvest decline. This loss includes hired crew only, not crew shares that permit holders pay themselves. These estimates generally agree with the standard in the Tanner fishery of 52 percent of ex-vessel value going to the boat, and the skipper and crew sharing the balance equally after payment of food, fuel and bait.

It is also assumed that variable costs account for 13 percent of the gross loss and that 80 percent of those variable expenditures are made with Southeast Alaska businesses. These variable costs include fuel, bait and food, as well as other variable costs. The category of "other" variable costs is intended to account for gear-related expenditures, which vary with the duration and intensity of the fishing effort.

Finally, it is assumed that marginal profit to permit holders accounts for 59 percent of the potential gross loss. These losses are applied to the predicted annual decline in the harvest from Glacier Bay. These future annual losses are then reduced to a present value (see Appendix 1 for detailed spreadsheets), providing a single lump-sum measurement of losses to permit holders, crew and support businesses.

Table 1.4 provides the assumptions used to estimate potential losses associated with processing Glacier Bay crab. The approach used is to identify average costs and marginal profits for the broad categories of products produced from Tanner crab. With this data, weighted-average costs and profits are calculated, with weighting based on the share of total production for each product type. Most Tanner crab is sold frozen, though in a variety of packaging forms.

Based on information provided by Tanner processors and other data, plant labor accounts for an average of 34 cents per net pound, or about 22 cents per gross pound, assuming an average recovery rate of 66 percent. Calculating annual losses to plant labor involved multiplying this estimate and the predicted annual decline in the Glacier Bay harvest (i.e., 22 cents for each pound the Glacier Bay harvest declines).

Potential losses to support businesses are calculated with a similar methodology. A weighted average of about 15 cents per net pound is spent on packaging. It is assumed that packaging is purchased entirely outside of Southeast Alaska. Expenditures on other variable costs, including packers and local shippers, are assumed to be spent almost entirely with local business. Freight costs are included in this analysis only to the extent that intra-regional shipping is required, such as shipping from Gustavus to Juneau. In summary, it is assumed that an average of 49 percent of variable costs, excluding labor, are spent in Southeast Alaska. On a net poundage basis, these variable costs total 29 cents and gross weight basis, 19 cents (based on 66 percent recovery). Therefore, annual losses to processing support businesses are estimated at 19 cents for each pound that the Glacier Bay harvest declines.

Table 1.4
Tanner Processor Financial Assumptions

	Dollars Per Finished Pound		
	<i>Weighted Average</i>	<i>Frozen</i>	<i>Fresh</i>
Variable Costs			
Labor	0.34	0.35	0.10
Packaging	0.15	0.15	0.10
Other Variable Costs	0.10	0.10	0.05
Total Variable Costs	0.58	0.65	0.25
<i>Variable Costs less Labor</i>	0.25	0.30	0.15
Margin (\$/Net lb.)	1.24	1.25	1.00
Recovery Rate	66%	64%	100%
Margin (\$/Gross lb.)	0.82	0.80	1.00
Production Share	100%	95%	5%
Est. % of Variable Costs Spent Locally (excl. Labor)	49%	50%	30%

Note: Due to rounding, some discrepancies between subtotals and totals may be evident in this and other tables.

Finally, potential losses to processing plant owners are estimated at \$1.24 per net pound, or approximately 82 cents per gross pound. In other words, for every pound that the Glacier Bay Tanner harvest declines, it is estimated that processors could lose 82 cents in marginal profits.

Present Value of Potential Future Losses

Tables indicating future annual net losses to permit holders, processors and other affected groups are provided in the appendix. The value today of predicted future losses depends on the period of those losses and the discount rate. In this study a period of 75 years is assumed, which is intended to represent losses in perpetuity. Discount rates of 3.0 percent and 5.3 percent are used.

Table 1.4 provides present values of potential losses for each affected group. All figures are rounded to the nearest thousandth and are presented in 1999 dollars.

Table 1.5

Present Value of Potential Future Tanner (Pot) Fishery Losses (3.0 Percent and 5.3 Percent Discount Rates)

<i>Harvest-related Totals</i>	3.0%	5.3%
Loss to Permit Holders	6,803,000	3,468,000
Loss to Vessel Crew	3,228,000	1,646,000
Loss to Harvest Support Businesses	1,199,000	611,000
Subtotal	\$11,230,000	\$5,725,000
<i>Processing Related Totals</i>		
Loss to Processors	3,753,000	1,915,000
Loss to Processor Employees	1,029,000	525,000
Loss to Processing Support Businesses	437,000	223,000
Lost Fish Tax Revenue	346,000	176,000
Subtotal	\$5,565,000	\$2,840,000
Grand Total	\$16,796,000	\$8,565,000

This analysis indicates that the present value of potential Tanner pot fishery-related losses total \$8.6 million (5.3 percent discount rate) to \$16.8 million (3.0 percent discount rate).

Actual Losses in the Tanner Pot Fishery

The presumed response of fisheries managers to commercial fishery closures and restrictions in Glacier Bay plays a critical role in how total losses to fishermen and others are measured. In the Tanner fishery, ADF&G managers have stated that the guideline harvest level for the Southeast Tanner fishery will decline by the same poundage that the

1 Glacier Bay harvest declines.¹² Therefore, in the Tanner fishery, the value
2 of Glacier Bay harvest will, over time, be entirely lost.¹³ There will be no
3 collective opportunity for substitution from other grounds. Individual
4 fishermen will fish other grounds and replace some or all of their Glacier
5 Bay harvest, but not the Southeast Tanner fleet collectively. In other
6 words, the potential losses presented in Table 1.5 represent actual losses
7 for present *and future* participants in the Tanner pot fishery.
8

9 As indicated in Table 1.5, the present value of losses to permit holders are
10 predicted to total from \$3.5 million to \$6.8 million (5.3 percent and 3.0
11 percent discount rates, respectively). This represents the collective losses
12 of fishermen qualifying for lifetime access, fishermen who have fished in
13 Glacier Bay in the past but do not qualify for lifetime access, and
14 fishermen who have never fished in the Bay. As discussed in the
15 methodology section of this report, all three of these groups of permit
16 holders would be expected to suffer some losses due to Glacier Bay
17 closures and restrictions.
18

19 As described in the methodology, this analysis does not include an
20 assessment of losses in permit values and other capital investments in the
21 Tanner pot fishery. It is likely that such losses in asset values will occur.¹⁴
22 However, measuring losses associated with capital investment *and* future
23 income in the Glacier Bay commercial fisheries, then paying
24 compensation for both types of losses would result in compensating
25 people for the same loss twice.
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¹² Personal communication with Tim Koeneman, ADF&G Shellfish Biologist, March 15, 2000.

¹³ The Southeast Tanner fishery is considered a “price-taker.” In other words, much larger volumes of Tanner production from elsewhere in Alaska generally determines market prices, therefore as the Southeast harvest declines prices would not be expected to increase.

¹⁴ Asset values could decline because the total profitability of the fishery could decline as the guideline harvest level is reduced. For example, based on CFEC permit value data, the total value of Tanner and combination permits in Southeast is approximately \$9 million. CFEC places T19A permit values at \$95,100. Combination permit values range from \$140,000 to \$180,000. Assuming an average Tanner permit value of \$100,000, multiplied by 94 permits (interim and permanent), the total value of all permits is \$9.4 million. If the GHL is reduced by 10 percent, the total value of permits could eventually drop to about \$8.5 million. A loss in the value of other investments in the Tanner fishery, including boats, could also occur, though predicting these losses would be very difficult. This decline in capital value would occur gradually over time (as the Glacier Bay harvest declines) rather than immediately. The per-permit decline in value will depend on the disposition of interim permits.

Chapter II. Losses in the Tanner Ring Fishery

Historical Harvest in Glacier Bay

Between 1989 and 1998, the Tanner ring harvest from Glacier Bay averaged approximately 11,000 pounds annually, with an average value of \$28,000, based on partial data from CFEC. This estimate is based on CFEC harvest data for open areas plus 10 percent to account for additional harvests in closed areas (data which is not available from CFEC). Harvests occurred in the areas now closed during four of the ten years between 1989 and 1998, but the size of the harvest is not disclosable.

Additional assumptions must be made to estimate the harvest from areas that are now closed to commercial fishing. Most of the Tanner ring harvest in Glacier Bay has occurred in the vicinity of the Beardslee Islands. The Beardslee Islands are included in area 11470, which is otherwise still open to fishing by lifetime access permit holders. Based on discussions with ring net fishermen, it is assumed that 80 percent of the past Glacier Bay harvest has come from areas now closed to commercial fishing. The assumption appears valid in light of the fact that Tanner ring net fishermen are generally limited to fishing in waters less than 40 fathoms deep.

According to CFEC data, 14 Tanner ring permit holders may qualify for lifetime access. Another 10 permit holders who fished during the qualifying years may not qualify for lifetime access.

Predicted Decline in Glacier Bay Harvest

The value of the Glacier Bay Tanner ring net harvest is assumed to drop by approximately \$23,000 immediately, as a result of loss of the closed areas. Based on predicted rates of retirement among permit holders with lifetime access, the harvest is expected to hold steady initially then decline until about 2025, when the Glacier Bay harvest drops to zero. At that time, the ex-vessel loss will total approximately \$29,000 annually.

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Table 2.1
Glacier Bay Tanner Harvest, Ring Gear
1989 to 1998

Total Glacier Bay				
Year	Permits*	Pounds	Value(\$)	Value (99\$)
1989	2	6,780	18,239	24,265
1990	5	6,182	12,364	15,491
1991	6	11,333	17,000	20,373
1992	7	19,727	43,184	50,056
1993	11	8,268	15,130	17,019
1994	8	9,692	23,649	26,041
1995	9	13,307	50,699	54,259
1996	12	10,198	21,528	22,418
1997	10	16,272	32,056	32,898
1998	10	11,836	23,199	23,499
1989-98 Ave.		11,360	\$25,705	\$28,632
Closed Areas (80% of the Bay harvest)				
Year		Pounds	Value(\$)	Value (99\$)
1989		5,424	14,591	19,412
1990		4,946	9,891	12,393
1991		9,067	13,600	16,298
1992		15,782	34,547	40,044
1993		6,614	12,104	13,616
1994		7,754	18,919	20,833
1995		10,645	40,559	43,407
1996		8,158	17,223	17,935
1997		13,018	25,645	26,318
1998		9,469	18,559	18,799
1989-98 Ave.		9,088	\$20,564	\$22,905
Open Areas (20% of the Bay harvest)				
Year		Pounds	Value(\$)	Value (99\$)
1989		1,356	3,648	4,853
1990		1,236	2,473	3,098
1991		2,267	3,400	4,075
1992		3,945	8,637	10,011
1993		1,654	3,026	3,404
1994		1,938	4,730	5,208
1995		2,661	10,140	10,852
1996		2,040	4,306	4,484
1997		3,254	6,411	6,580
1998		2,367	4,640	4,700
1989-98 Ave.		2,272	\$5,141	\$5,726

Source: McDowell Group estimates based on CFEC data.

*Permits fished is based on data for open areas only. The total number of permits fished in the Bay may be slightly higher if there were fishermen that fished in the areas now closed but not in the open areas.

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Financial Assumptions

Potential losses to permit holders, crew, processors and support business are based on the assumptions shown in Tables 2.2 and 2.3.

Table 2.2

Tanner Harvest (Ring) Financial Assumptions

	% of Gross Revenue
Variable Costs	
Crew	10.0%
Fuel/Bait/Food	10.0%
Other Variable Costs	5.0%
<i>Total Variable Costs</i>	25.0%
<i>Total Variable Costs Less Crew</i>	15.0%
Marginal Profit	75.0%
Estimated % of Variable Costs Spent Locally (excl. labor)	80%

Potential crew losses are assumed to account for 10 percent of the ex-vessel value of the harvest decline. It is also assumed that variable costs account for 15 percent of the gross loss and that 80 percent of those variable expenditures are made with Southeast Alaska businesses. Finally, it is assumed that marginal profit to permit holders accounts for 75 percent of the gross loss.

Table 2.3 provides the assumptions used to estimate potential losses associated with processing Glacier Bay crab. The assumptions are identical to those made in the analysis of losses associated with the Tanner pot fishery.

Plant labor accounts for an average of 34 cents per net pound, or about 22 cents per gross pound, based on an average recovery rate of 66 percent. It is assumed that an average of 49 percent of variable costs, excluding labor, are spent in Southeast Alaska. On a net poundage basis, these variable costs total 29 cents and gross weight basis, 19 cents (based on 66 percent recovery).

Potential losses to processing plant owners are estimated at \$1.24 per net pound, or approximately 82 cents per gross pound.

Table 2.3**Tanner Processor Financial Assumptions**

Dollars Per Finished Pound			
	<i>Weighted Average</i>	<i>Frozen</i>	<i>Fresh</i>
Variable Costs			
Labor	0.34	0.35	0.10
Packaging	0.15	0.15	0.10
Other Variable Costs	0.10	0.10	0.05
Total Variable Costs	0.58	0.65	0.25
<i>Variable Costs less Labor</i>	0.25	0.30	0.15
Margin (\$/Net lb.)	1.24	1.25	1.00
Recovery Rate	66%	64%	100%
Margin (\$/Gross lb.)	0.82	0.80	1.00
Production Share	100%	95%	5%
Est. % of Variable Costs Spent Locally (excl. Labor)	49%	50%	30%

Present Value of Potential Future Losses

Table 2.4 provides the present value of potential losses for each affected group. All figures are rounded to the nearest thousand and are presented in 1999 dollars. The present value of total losses associated with the Tanner ring net fishery area estimated at \$670,000 (5.3 percent discount rate) to \$1.1 million (3.0 percent discount rate).

Table 2.4

**Present Value of Potential
Future Tanner (Ring Net) Fishery Losses
(3.0 Percent and 5.3 Percent Discount Rates)**

<i>Harvest-Related Totals</i>	3.0%	5.3%
Loss to Permit Holders	\$584,000	\$352,000
Loss to Vessel Crew	78,000	47,000
Loss to Harvest Support Businesses	93,000	56,000
Subtotal	\$756,000	\$455,000
<i>Processing-Related Totals</i>		
Loss to Processors	\$250,000	151,000
Loss to Processor Employees	45,000	27,000
Loss to Processing Support Businesses	37,000	22,000
Lost Fish Tax Revenue	23,000	14,000
Subtotal	\$356,000	\$214,000
Grand Total	\$1,112,000	\$669,000

Actual Losses in the Tanner Ring Fishery

As with the Tanner pot fishery, in the Tanner ring fishery the value of Glacier Bay harvest will, over time, be entirely lost. There will be no collective opportunity for substitution from other grounds. The potential losses presented in Table 2.4 represent actual losses for participants in the Tanner ring fishery, totaling \$670,000 to \$1.1 million.

For the Tanner ring fishery, it is possible that losses could actually exceed the potential losses present in Table 2.4. With the loss of 80 percent of the fishable grounds, the Tanner ring fishery could, for all practical purposes, be eliminated. The concentration of fishing effort in the few areas that remain open to lifetime access permit holders could result in over-fishing and a consequent decline in productivity from those grounds. In addition, with only 20 percent of the resource available for harvest, individual fishermen may no longer find it cost-effective to participate in the fishery. The impact on these fishermen would be the same as if the fishery were completely eliminated.

In any case, if the fishery is effectively eliminated, losses could equal the total value of the fishery, which is approximately \$41,000 per year, based on the average first whole value of the Tanner ring harvest during the 1989 to 1998 period. The present value of future losses would total \$670,000 to \$1.1 million (5.3 percent and 3.0 percent discount rates, respectively, over 75 years).

Chapter III. Losses in the Halibut Fishery

Profile of the Fishery

The commercial halibut fishery in Alaska is over 100 years old. Commercial vessels and harvest are documented as early as the 1890s, with reliable statistical information dating from the 1920s forward. From 1930 through 1970, U.S. [Alaska] halibut harvest remained quite stable. With few exceptions, it ranged from 30 million to 40 million pounds per year. That changed in the 1970s, when U.S. harvest dropped to about half that level, bottoming out in 1980. The reduction in availability, combined with proliferation of freezer technology in major overseas markets, resulted in substantial price increases throughout the decade. When stocks rebounded and landings increased sharply throughout the 1980s, demand grew apace and prices remained relatively high.

As halibut fishing became more lucrative in the 1970s and 1980s participation grew dramatically and seasons became progressively shorter in an effort to keep the Alaska harvest at sustainable levels. This created quality and logistical problems for the product and also resulted in serious issues of overcapitalization and safety for the fleet. What had for decades been a stable, months-long fishery dominated by a modest fleet of specialized vessels was now characterized by thousands of small boats fishing around the clock for one or two days at a time in an effort to hit the jackpot. By the time alternative management regimes were being seriously considered in the 1980's, seasons were as short as three days. In some years statewide halibut harvest averaged more than 20 million pounds per day.

The Individual Fishing Quota (IFQ) management system was implemented in 1995. Fishermen with qualifying catch history were granted the rights to harvest a specific portion of the allowable catch based on their harvest history within the management areas where they had fished. These quotas are salable (subject to certain restrictions) and change from year to year in accordance with target harvest levels that are based on abundance.

The advent of IFQ management has had a number of significant impacts on the Alaska halibut fishery:

- With effective harvest limitations in place, the season was extended from a matter of days to eight months. Fishermen with halibut quota may harvest it any time during the season.
- Because of the season extension, fishermen are more likely to participate in other fisheries knowing they can fish their halibut quota when it best suits them.
- There has been substantial consolidation of quota shares and vessel usage within the halibut fleet since inception of IFQ management. The number of individual quota shareholders dropped by 21 percent between 1995 and 1998 and the number of vessels participating in the fishery declined by 22 percent over the same period. The number of

halibut quota shares remains unchanged but fewer people and boats participate in the fishery, harvesting more poundage per capita.

- Ex-vessel prices for halibut are at or near historic highs, the result of a market shift from frozen to fresh product. This is attributable to IFQ management in that the length of the season enables fishermen to focus on quality and delivery timing, maximizing value.
- Crew members are investing in quota shares. This is a departure from the typical arrangement in which harvesting rights are held by the vessel owner/operator.

As the IFQ halibut fishery enters its sixth year, it has become common practice in the halibut fleet for crew members to hold halibut quota. This has proven to be a mutually beneficial arrangement as it reduces fixed expenses for vessel owners and eliminates vessel operating costs for the other quota holders aboard. Typically, quota holders who do not have an ownership stake in the vessel pay a vessel lease fee to the owner (generally 25 percent to 40 percent) or trade their labor as crewmembers fishing the owner's quota shares, "working off" the lease fee at standard crewshare rates.

Some operators require that all their crewmembers hold a minimum amount of halibut quota. This has the effect of displacing crew members who do not invest, and of creating a high-debt-load situation for those who do invest. Specifically designed loan programs have been created to accommodate crew members investing in the fishery.

In the long run, crew member investment results in fleet reduction as vessels best suited for efficient longline operations attract more and larger quota holders. Owners of such vessels realize financial benefits through lease fees or crew cost reductions -- without the capital expense of investment in quota shares. There are regulatory limits in place to prevent excessive consolidation, but the clear financial advantages of having multiple quota holders aboard one boat make it likely that consolidation will continue to the extent allowed by regulation.

Historical Harvest in Glacier Bay

Prior to 1992, the Glacier Bay halibut harvest was included in International Pacific Halibut Commission (IPHC) area 182, which covered Icy Strait, including Glacier Bay proper. In 1992, IPHC established statistical area 184, consistent with the boundaries of Glacier Bay proper.

For the years 1992 through 1998, the halibut harvest in Glacier Bay averaged 300,000 pounds annually. In 1999 dollars the harvest's value averaged \$564,000. This data includes commercial halibut landings where the permit fisheries were B06B and B61B. Over the period 1992 through 1998, the Glacier Bay halibut harvest accounted for approximately 3 percent of the total Southeast harvest, ranging from 1.7 percent in 1993 to a high of 3.9 percent in 1995.

Table 3.1

**Glacier Bay Halibut Harvest
Percent of Southeast (2C) Total, 1992 to 1998**

Year	Total 2C Halibut Harvest (lbs)	Total Glacier Bay Harvest (lbs)	Glacier Bay Percent of Total
1992	9,819,000	293,004	3.0%
1993	11,290,000	188,444	1.7%
1994	10,379,000	281,483	2.7%
1995	7,761,000	303,674	3.9%
1996	8,737,000	321,893	3.7%
1997	9,753,000	365,376	3.7%
1998	9,660,000	349,727	3.6%
1992-98 Ave	9,628,429	300,514	3.1%

Fish ticket data is not available on the percent of the Glacier Bay harvest that came from waters that are now closed to commercial fishing. Halibut fishermen contacted during the course of this study provided estimates ranging from 15 percent to 50 percent. Based on log-book data and discussions with Glacier Bay fishermen, it is estimated that harvests from now-closed areas have accounted for 30 percent of the total Glacier Bay harvest. The harvest data presented in table 3.2 is based on this estimate.

CFEC data indicates that 74 halibut quota shareholders may qualify for lifetime access. There are 92 quota shareholders that fished in Glacier Bay during the qualifying years (at least one fish ticket reported) who may not qualify for lifetime access. Lifetime access is defined as landings/participation in two or more years from 1992-1998. No access is defined as landings/participation in less than two years from 1992-1998. Over the seven-year period from 1992 to 1998, quota shareholders qualifying for lifetime access have accounted for approximately 85 percent of the total Glacier Bay harvest.

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Table 3.2

**Glacier Bay Halibut Harvest
1992 to 1998, Area 184**

Total Harvest in Glacier Bay				
	People	Pounds	Value(\$)	Value (99\$)
1992	43	293,004	295,232	342,211
1993	31	188,444	245,050	275,658
1994	38	281,483	565,115	622,275
1995	57	303,674	619,741	663,259
1996	47	321,893	724,017	753,952
1997	56	365,376	818,442	839,921
1998	57	349,727	444,153	449,906
1992-98 Ave.	37	300,514	\$530,250	\$563,883
Harvest in Closed Areas (30% of the Bay harvest)				
		Pounds	Value(\$)	Value (99\$)
1992		87,901	88,570	102,663
1993		56,533	73,515	82,697
1994		84,445	169,534	186,683
1995		91,102	185,922	198,978
1996		96,568	217,205	226,186
1997		109,613	245,533	251,976
1998		104,918	133,246	134,972
1999				
1992-98 Ave.		90,154	\$159,075	\$169,165
Harvest in Open Areas (70% of the Bay harvest)				
		Pounds	Value(\$)	Value (99\$)
1992		205,103	206,662	239,548
1993		131,911	171,535	192,961
1994		197,038	395,580	435,593
1995		212,572	433,818	464,281
1996		225,325	506,812	527,766
1997		255,763	572,910	587,944
1998		244,809	310,907	314,934
1999				
1992-98 Ave.		210,360	\$371,175	\$394,718

Source: Total Glacier Bay harvest data provided by ADF&G. Estimates of harvest in closed areas and areas that remain open are McDowell Group estimates.

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To predict future losses in the Glacier Bay halibut fishery, the average value of the baseline halibut harvest has been increased to reflect the impacts of IFQs on the prices paid to fishermen. The average price paid to fishermen during the 1992 to 1998 period was approximately \$1.88 per pound (in 1999 dollars). The average price paid for the years 1995 through 1998 was \$2.02 per pound. In predicting future losses, the value of the baseline harvest has been increased by 8 percent to reflect this apparent IFQ-driven value increase.

Predicted Decline in Glacier Bay Harvest

The value of the Glacier Bay halibut harvest is assumed to decline by approximately \$182,000 immediately, as a result of loss of the closed areas. The harvest will then decline at the predicted rate of retirement of the lifetime access permit holders, with the Glacier Bay harvest dropping to zero by about 2022. At that time and thereafter, the ex-vessel loss will total approximately \$607,000 annually.

The actual decline in the Glacier Bay halibut harvest could occur at a rate substantially different than predicted in this study. It is possible that the last few halibut fishermen with access to Glacier Bay could purchase the maximum allowable quota shares (1 percent of the 2C total) and concentrate their effort on Glacier Bay. This means that with only three or four fishermen still in the Bay, the harvest could still total hundreds of thousands of pounds.

Financial Assumptions

Potential losses to permit holders, crew, processors and support businesses are based on the assumptions shown in Tables 3.3 and 3.4.

Table 3.3

Halibut Harvest Financial Assumptions

	% of Gross Revenue
Variable Costs	
Crew	15.0%
Fuel/Bait/Food	12.0%
Other Variable Costs	3.0%
<i>Total Variable Costs</i>	30.0%
<i>Total Variable Costs Less Crew</i>	12.0%
Marginal Profit	70.0%
Estimated % of Variable Costs Spent Locally (excl. Crew)	80%

These assumptions indicate that potential crew losses account for 15 percent of the gross or ex-vessel value of the harvest decline (not including crew shares permit holders may pay themselves). The

assessment of potential crew losses in the halibut longline fishery is complicated by the fact that under the IFQ system, crew are earning a smaller proportion of the value of the harvest than compared to years prior to IFQs. Today, many IFQ holders fish together, crewing for one another. A common arrangement for an IFQ holder is to pay a boat owner some percentage of his quota share harvest value as compensation for use of the boat.

Variable costs (excluding crew) are assumed to account for 15 percent of the gross loss, and 80 percent of those variable expenditures are made with Southeast Alaska businesses. These variable costs include fuel, bait and food, as well as other variable costs, primarily gear-related expenditures.

It is assumed that marginal profit to quota shareholders accounts for 70 percent of the potential gross loss. It is important to recognize that these financial assumptions may not accurately reflect losses to any particular quota shareholder. Some quota shareholders qualifying for lifetime access may not have fished their own boats in the Bay. Alternatively, some vessel owners active in the Bay may have earned additional income by fishing others' quota shares. These boat owners may not qualify for lifetime access if they didn't fish their own shares in the Bay (though they may lease their boats to fishermen with lifetime access). Nevertheless, overall, the total profitability of the fishery is independent of how the profits are split among permit holders, boat owners and others. The issue of how to split compensation among these participants will be addressed in the next phase of the Glacier Bay Compensation Plan.

Table 3.4 provides the assumptions used to estimate potential losses associated with processing Glacier Bay halibut. As with other fisheries, the approach used is to identify average costs and marginal profits for the broad categories of products produced from Glacier Bay halibut. With this data weighted average costs and profits are calculated, with weighting based on the share of total production accounted for by each product type.

Based on information provided by halibut processors and other data, plant labor accounts for an average of 9 cents per net pound, or about 8 cents per gross pound, based on an average recovery rate of 94 percent. Therefore, potential loss to crew is equal to 8 cents for each gross pound the Glacier Bay harvest declines.

It is assumed that an average of 57 percent of variable costs, excluding labor, are spent in Southeast Alaska. On a net poundage basis, these variable costs total about 8 cents, and on a gross weight basis, 7 cents (based on 66 percent recovery). Therefore, annual losses to processing-support businesses are estimated at 7 cents for each pound that the Glacier Bay harvest declines.

Table 3.4

Halibut Processor Financial Assumptions

	Dollars Per Finished Pound			
	<i>Weighted Average</i>	<i>Fresh</i>	<i>Frozen</i>	<i>Fillet</i>
Variable Costs				
Labor	0.09	0.05	0.12	0.25
Packaging	0.08	0.10	0.05	0.08
Other Variable Costs	0.05	0.05	0.05	0.05
Total Variable Costs	0.23	0.20	0.22	0.38
<i>Variable Costs less Labor</i>	0.13	0.15	0.10	0.13
Margin (\$/Net lb.)	0.56	0.60	0.45	0.70
Recovery Rate	0.94	100%	97%	53%
Margin (\$/Gross lb.)	0.52	0.60	0.44	0.37
Production Share	100%	55%	35%	10%
Est. % of Variable Costs Spent Locally (excl. Labor)	57%	65%	50%	40%

Note: Due to rounding, some discrepancies between subtotals and totals may be evident in this and other tables.

Losses to processing plant owners are estimated at 56 cents per net pound, or approximately 52 cents per gross pound. In other words, for every pound that the Glacier Bay harvest declines, it is estimated that processors will lose 52 cents in marginal profits.

Present Value of Potential Future Losses

Tables indicating future annual net losses to quota share holders, processors and other affected groups are provided in the appendix. Based on discount rate of 5.3 percent and 3.0 percent, the total present value of all potential losses is estimated at \$9.4 million to \$17.4 million. Table 3.5 provides the present value of losses for each affected group.

Table 3.5

**Present Value of Potential Future
Halibut Fishery Losses
(3.0 Percent and 5.3 Percent Discount Rates)**

<i>Harvest-related Totals</i>	3.0%	5.3%
Loss to Quota Share Holders	\$9,481,000	\$5,139,000
Loss to Vessel Crew	2,032,000	1,101,000
Loss to Harvest Support Businesses	1,625,000	881,000
Subtotal	\$13,138,000	\$7,122,000
 <i>Processing Related Totals</i>		
Loss to Processors	2,961,000	1,605,000
Loss to Processor Employees	478,000	259,000
Loss to Processing Support Businesses	401,000	217,000
Lost Fish Tax Revenue	406,000	220,000
Subtotal	\$4,246,000	\$2,302,000
 Grand Total	 \$17,384,000	 \$9,424,000

Issues Affecting Actual Losses in the Halibut Fishery

The potential losses presented above are based on the assumption that the income generated in the Glacier Bay halibut fishery will be entirely lost and that harvests from other areas will not replace any portion of the Glacier Bay harvest – an assumption made in the assessment of Tanner fishery losses. Actual losses in the halibut fishery may not reach this worst case scenario, however, if harvests from other waters replace some or all of the value of the Glacier Bay harvest. In the Tanner fishery, ADF&G managers indicate that the resource cannot replace what is lost from closure of Glacier Bay and therefore the guideline harvest level must be reduced. However, for the halibut fishery, the International Pacific Halibut Commission (IPHC) has stated that no reduction in the Area 2C quota would occur as a result of declining harvests in Glacier Bay.¹⁵ This implies either that the halibut resource in Glacier Bay is wide-ranging and therefore will be available for harvest outside the Bay, or that the halibut resource outside of Glacier Bay in Area 2C is of sufficient strength to fully replace the lost Glacier Bay resource.

The assumption that no adjustment to harvest limits will be required has important implications on how losses associated with closing Glacier Bay are calculated. Because of the importance and complexity of this issue, further discussion is warranted. First, research conducted in Glacier Bay on the halibut resource does not support the premise that Glacier Bay halibut are wide-ranging. A multi-year research project, conducted by

¹⁵ Personal communication with Bill Clark, IPHC Stock Assessment Biometrician, May 16, 2000. Also, see letter from Bruce M. Leaman, Executive Director of IPHC, to Robert Bosworth, Deputy Commissioner, ADF&G, dated July 5, 2000.

the U.S. Geological Survey, Alaska Biological Research Center,¹⁶ found that:

“...juvenile fish move widely but often still within the Glacier Bay area, whereas large sexually mature individuals exhibit much smaller home ranges...often less than 0.5km², and exhibit both within-year and between-year site fidelity.” However, “...a few larger individuals [halibut] appear never to establish home ranges.”

It is beyond the scope of this study to consider the biologic implications of closing Glacier Bay to commercial fishing. However, to the layperson, there would appear to be some inconsistency between the research that suggests that Glacier Bay halibut are territorial and a broader management assumption that halibut are wide-ranging.¹⁷ If Glacier Bay halibut are, for the most part, territorial within the Bay, it could reasonably be expected that catch-per-unit-of-effort (CPUE) would decline outside the Bay after closure, especially in the Icy Strait area where some of the effort may be relocated.¹⁸ Changes in CPUE, due to dislocated Glacier Bay effort, would no doubt be masked by broader trends in halibut population (between 1992 and 1998, the Glacier Bay harvest accounted for about 3 percent of the 2C harvest). Still, declining CPUE due to Glacier Bay closures could contribute – in some small measure – to reductions in the catch limit.

To the extent that the Glacier Bay halibut resource is a resident resource, the commercial value of the Glacier Bay harvest has been lost. Even if future management of the halibut fishery does not fully reflect the loss of the Glacier Bay resource, the commercial fishing industry and the State of Alaska have lost some or all of that commercial value. From this perspective, the potential losses presented in Table 3.5 represent actual losses for present and future participants in the halibut fishery.¹⁹

Nevertheless, if we accept the premise that the Glacier Bay halibut resource is migratory, and that the 2C quota will not be reduced, losses are not equal to the value of the Glacier Bay harvest. Instead, losses are dependent on how efficiently fishermen can replace the Glacier Bay harvest with harvests from other areas. In other words, financial losses suffered by fishermen excluded from the Bay will be equal to reduced profitability associated with their attempts to replace their Glacier Bay harvest with an equivalent harvest from areas outside the Bay. (This reduced profitability could stem either from increased costs or reduced harvest.)

¹⁶ Phillip N. Hooge and Spencer J. Taggart, “Pacific Halibut in Glacier Bay National Park, Alaska”, USGS Alaska Biological Science Center, <http://www.absc.usgs.gov/glba/halibut.htm>

¹⁷ The USGS researchers point out that “Long distance movements have been emphasized in previous studies (Skud 1977; St-Pierre 1984) and most population models developed for this species assume relatively unrestricted movements between areas (Quinn et al. 1985).”

¹⁸ Area 2C CPUE has been declining in recent years, dropping from 243 net pounds per skate in 1997 to 205 pounds per skate in 1999, according the IPHC data.

¹⁹ An alternative view of this issue is one that suggests that the halibut resource in Southeast could be enhanced as a result of creation of a marine reserve in Glacier Bay. In theory, a marine reserve could result in increased reproductive success, with spill-over benefits in areas outside the reserve. No attempt has been made in this study to quantify these potential benefits, if any.

Predicting the reduction in profitability in the halibut fishery is a difficult and subjective task. The range of actual losses experienced by individual fishermen will be very broad. Some permit holders may not experience any actual loss in profit due to loss of access to Glacier Bay. These fishermen might be able to relocate their fishing effort and catch an equivalent number of fish without incurring additional expenses. At the other end of the spectrum are fishermen who may have significant difficulty replacing their Glacier Bay harvest. Presumably, most permit holders that have lost access to all or part of Glacier Bay will find themselves somewhere in the middle, suffering some loss in marginal profits because they are unable to replace their Bay harvest with an equally profitable harvest outside the Bay.²⁰

In addition, Glacier Bay halibut fishermen contacted during the course of this study have noted that Glacier Bay halibut are, on average, larger than halibut taken from other waters. Larger fish often draw a higher price than smaller fish. This suggests that even if fishermen are able to replace, pound-for-pound, their Glacier Bay harvest, the harvest may be of lower value.²¹

In addition to quota shareholders who do not qualify for lifetime access, fishermen qualifying for lifetime access will also incur increased costs as a result of the closure of certain areas of the Bay. Halibut fishermen may be unable to find protected waters in the Bay to fish when seas are high. That could mean exposing themselves to greater risk, more “down time” for fishermen as they wait for the weather to improve, or both. In addition, with the loss of certain areas of the Bay, fishermen also expect to be limited by the tides to fishing only during periods of moderate tidal action (the portion of Glacier Bay that remains open to lifetime access permit holders is subject to strong tidal currents).

These concerns have been confirmed by halibut fishermen working in the Bay during the 2000 season.²² Fishermen fishing in the Bay during May and June of 2000 also report a significant increase in the number of boats fishing in Glacier Bay compared to previous years. If this more concentrated fishing effort persists after implementation of the lifetime access program, the average fishermen could expect to see his harvest from the Bay decline.

Finally, it should be noted that commercial halibut fishermen dislocated from the Bay will face increasing competition from the growing sport charter fleet. Between 1990 and 1998, the number of registered charter vessels in Southeast Alaska grew from 351 to 1,240: an increase of 253 percent. Charter vessel logbook data from 1998 for Area 182 (Icy Strait) indicate that sport charter halibut harvest was 160,000 pounds that year. The 1998 commercial harvest in area 182 was 440,000 pounds. This

²⁰ The issue is further complicated by the fact that losses to fishermen could be higher in the near-term, then decline over time as fishermen become familiar with new grounds and perhaps return to their original level of profitability.

²¹ ADF&G, IPHC and CFEC do not have data on the average size of fish taken in Glacier Bay (Area 184).

²² Personal communication with Frank Warfel (May 22, 2000) and Craig Will (June 13, 2000)

represents a split of 27 percent to sport charter operators and 73 percent to commercial fishermen.

In summary, in predicting losses to halibut fishermen, the following factors are important to consider:

- The IPHC is not expected to reduce the allowable harvest in response to the loss of Glacier Bay. This suggests that, from a management perspective, fishermen should be able to replace their lost Glacier Bay harvest with harvests from other waters within Area 2C.
- Fishermen excluded from the Bay could experience reduced profitability on their quota shares because they will have to fish longer, burn more fuel, use more bait and increase wear-and-tear on their gear as they learn new grounds.
- Fishermen excluded from the Bay face could more downtime as they wait for suitable weather conditions in Icy Strait or other areas less favorable than Glacier Bay (or these fishermen may expose themselves to greater risk if forced to fish during poor weather).
- Increasing competition from the charter fleet in Icy Strait may limit the area's ability to serve as a substitute for the Glacier Bay harvest.
- Some fishermen may be unable to fully fill their quota share because of their unfamiliarity with new grounds or because of weather-related limitations.
- Lifetime access fishermen have lost productive grounds in the closed areas of the Bay (estimated at 30 percent of Area 184 harvest).
- Fishermen with lifetime access may face increased crowding in the waters of Glacier Bay that remain open.
- Fishermen with lifetime access could experience increased costs due to longer running time between safe anchorage and the fishing grounds, as well as increased down-time due to weather and tidal restrictions.
- Though IPHC has said it will not change Area 2C catch limits closure of Glacier Bay could (in some small measure) contribute to reduced CPUE and therefore contribute to areawide catch limit reductions.

While all of these factors are important and the potential financial impact of closing Glacier Bay to commercial halibut fishing is very significant (with a total present value of \$9 million to \$17 million at risk), it is impossible to predict with any degree of certainty what actual losses might be. Several years from now, after the commercial fishing restrictions for Glacier Bay are in place, it might be possible to measure actual declines in efficiency and profitably suffered by Glacier Bay fishermen. In advance of those closures, however, there are no research tools or case studies available to provide data on the potential decline in profitability.

Given the uncertainty associated with predicting losses in the halibut fishery, it is more appropriate to identify a range of possible losses. The \$9 million to \$17 million potential loss, including \$5 million to \$9 million in potential losses to quota shareholders, represents the worst case scenario. This level of loss would only occur if, ultimately, the Area 2C halibut harvest does decline because of the Glacier Bay harvest (and the 2C harvest declines by the same amount as the Glacier Bay harvest).

To identify the lower end of the range of potential losses to quota shareholders, assumptions about declining productivity must be made. At the least, quota shareholders will experience a decline in profits on the quota share harvested in Glacier Bay (for the reasons listed above). This decline in profits will result from increased expenditures on food, fuel, bait and gear, as more time and effort is required to harvest Glacier Bay fishermen's quota shares. To identify a low case scenario for quota share holders the following assumptions have been made:

- Fishermen will initially be able to replace only 70 percent of their past Glacier Bay harvest.
- Over a period of about 10 years, fishermen's effort to replace their past Glacier Bay harvest will be more successful and reach 100 percent.
- Variable costs will double (from 15 percent to 30 percent of ex-vessel value) initially to replace that harvest.
- Variable costs will decline slowly and finally level off at about 20 percent after approximately six years.

Based on these assumptions, the present value of future losses to quota shareholders totals approximately \$1.2 million to \$1.6 million (based on discount rates of 5.3 percent and 3.0 percent, respectively).²³ This estimate reflects the loss to all Glacier Bay fishermen, including those with lifetime access and those without lifetime access. It does not include potential losses to fishermen who have never fished in Glacier Bay but could experience some dislocation effects (increased competition from fishermen dislocated from the Bay.)

The assumption that the Area 2C halibut resource can fully replace the lost Glacier Bay resources also has important implications on Glacier Bay-related losses to crew, processors, their employees and support businesses.

Crew working on halibut boats will also suffer losses as a result of reduced crew-share basis. Crew shares are usually based on total ex-vessel less food, fuel and bait. Because more fishing effort will be required to fill quota shares formerly taken in Glacier Bay, crew shares will decline. While the present value of potential future losses to crew is slightly under \$1.1 million, actual losses could be less. Based on the same assumptions made for predicting losses to quota shareholders, the present value of losses to crew would be approximately \$140,000 to \$175,000.²⁴

Losses to halibut processors would be limited to the profit margin on unfilled quota, plus potential redistribution effects. However, there could be some redistribution effects that result in losses for specific businesses or individuals. Processor losses associated with unfilled quota are estimated at \$180,000 to \$195,000. In theory, losses to processors should not be greater than this because the same volume of fish (less unfilled

²³ Calculations are provided in the appendix under "Halibut Fishery Annual and Total Losses".

²⁴ The State of Alaska study of halibut fishery losses predicted no losses to crew.

1 quota) is available to them after Glacier Bay closures and restrictions as
2 before – the only change is that some of the fish is being harvested in a
3 different location. Given the mobility and time flexibility of the fleet,
4 fishermen should be able to continue to sell their catch when and where
5 they can demand the highest price.
6

7 Businesses providing goods and services to fishermen could enjoy
8 increased business sales because fishermen will actually be spending
9 more money on fuel, bait and gear to catch the same volume of fish.
10 Businesses providing goods and services to processors should not see any
11 change in the sales because processors should be handling the same
12 volume of fish.
13

14 These conclusions are true in concept, but in reality there could be some
15 redistribution effects that could result in losses for specific businesses or
16 individuals. It is not possible to predict how the halibut harvest will
17 ultimately be redistributed in northern Southeast Alaska as the Glacier
18 Bay harvest diminishes. However, to the extent there is some
19 redistribution, some businesses and communities could experience losses,
20 while others experience gains associated with Glacier Bay closures.²⁵
21

22 In summary, there is very wide range of possible losses in the halibut
23 fishery stemming from closure of Glacier Bay. Further, calculation of
24 these estimates of losses requires subjective assumptions. The criteria
25 used to determine eligibility for compensation should reflect this
26 uncertainty and subjectivity.²⁶
27

²⁵ To account for potential losses due to redistribution, some compensation funds should be set aside for individuals or businesses that feel they have or will suffer financial impacts from redistribution.

²⁶ In impact assessments where predicted outcomes are uncertain, it is possible to model that uncertainty by applying probabilities to each predicted outcome. However, a level of research into the halibut resource in Icy Strait and Area 2C far beyond what is possible for this assessment would be required to accurately predict probabilities.

Chapter IV. Losses in the Dungeness Fishery

Profile of the Fishery

The Dungeness crab fishery is a relative newcomer to limited entry. A moratorium on new permits was enacted in 1992 and entry to the fishery was formally limited in 1996. Permits were awarded to participants based on their fishing history between 1988 and 1992. There are six limited entry permit types that allow commercial access to the Dungeness crab resource in Southeast Alaska. Four of these permit types are for the pot fishery. A total of 318 Dungeness pot permits were issued. Participation was relatively high at 243 permits in 1998, or 76 percent of the total issued.

Dungeness pot permits are defined by pot limits in 75-pot increments: 75, 150, 225 and 300 pots. The pot-limit class of a permit is based on the cumulative harvest poundage of the initial issuee during the qualifying years.

- 128 75-pot permits were issued and 78 were fished in 1998. Participation was 61 percent. Average ex-vessel earnings in 1998 were \$6,685.
- 90 150-pot permits were issued and 74 were fished in 1998. Participation was 82 percent. Average earnings in 1998 were \$11,812.
- 48 225-pot permits were issued and 42 were fished in 1998. Participation was 88 percent. Average earnings in 1998 were \$19,085.
- 52 300-pot permits were issued and 49 were fished in 1998. Participation was 94%. Average earnings in 1998 were \$28,633.

A total of 51 interim use permits were issued for the Dungeness pot fishery in 1998. These permits allow fishermen whose limited entry applications are under review to continue fishing while the case is being considered. Most interim use permits (40 of 51) are for the 75-pot designation and are under review for challenges to pot-limit designation or for transferability. Upon resolution of an interim use case, the permit is either eliminated or converted to normal status of the appropriate designation.

A combined total of 13 permanent, non-transferable permits were issued for the Dungeness ring net and dive fisheries. None of these permits was fished in 1998 or in 1999. Harvest data for previous years is considered confidential, as permits fished did not exceed four in either fishery.

Harvest in the Southeast Alaska Dungeness fishery has varied widely over the last 20 years, though this does not necessarily result in significant price impacts. The Dungeness fishery in Southeast is one of seven fisheries on the West Coast of North America that typically supplies over one million pounds per year. Crab prices in Southeast Alaska are influenced in large part by supply levels resulting from the larger fisheries off the West Coast of British Columbia, Washington, Oregon and California. In the last three years, Alaska has supplied less than 10 percent of the total Dungeness crab harvest from the West Coast of North America.

Historical Harvest in Glacier Bay

For the years 1989 through 1998, the Dungeness harvest in Glacier Bay averaged 187,000 pounds. In 1999 dollars the harvest's value averaged \$274,000. All of Glacier Bay is now closed to commercial Dungeness fishing.

Over the period 1989 through 1998, the Glacier Bay Dungeness harvest accounted for approximately 6 percent of the total Southeast harvest, ranging from 3 percent in 1997 and 1998 to a high of 12 percent in 1993.

Annual participation, harvest and value data for the Glacier Bay Dungeness harvest for the years 1989 through 1998 is shown in Table 4.2.

Table 4.1

Total Southeast and Glacier Bay Dungeness Harvest 1989 to 1998

	Southeast Harvest (lbs)	Glacier Bay Harvest (lbs)	Percent of Total
1989	1,936,589	135,171	7%
1990	2,667,105	133,218	5%
1991	4,696,399	207,356	4%
1992	3,094,636	215,948	7%
1993	2,531,526	299,291	12%
1994	1,921,356	195,517	10%
1995	4,362,325	214,467	5%
1996	4,997,558	270,415	5%
1997	4,008,748	132,122	3%
1998	2,407,104	66,598	3%
1989-98 ave.	3,262,335	187,010	6%

Source: ADF&G.

Table 4.2

**Glacier Bay Dungeness Harvest
1989 to 1998
Areas 114-60, 70-77**

	Landings	Permits	Pounds	Value(\$)	Value (99\$)
1989	89	20	135,171	\$154,456	\$205,481
1990	98	12	133,218	197,829	247,870
1991	114	12	207,356	271,844	325,774
1992	142	14	215,948	200,678	232,611
1993	124	11	299,291	313,058	352,161
1994	86	9	195,517	244,983	269,762
1995	119	11	214,467	364,594	390,196
1996	118	14	270,415	295,023	307,221
1997	137	14	132,122	299,653	307,517
1998	83	12	66,598	103,560	104,901
1989-98 Ave.			187,010	\$244,568	\$274,349

Source: ADF&G. Value estimates based on CFEC data

CFEC data indicates that 57 Dungeness fishermen with Glacier Bay harvests between 1987 and 1998 did not qualify for the buyout. To qualify for the buyout, fishermen had to fish in six of the twelve years from 1987 and 1998. During this period, fishermen not bought out accounted for 34 percent of the total Glacier Bay Dungeness harvest.

The following estimates of potential economic losses focus on permit holders not bought out, crew for all permit holders (including crew for permit holders who were bought out), as well as processors, their employees, and support businesses.

Financial Assumptions

Potential losses to non-bought-out permit holders, all crew, processors and support business are based on the assumptions shown in Tables 4.3 and 4.4.

Table 4.3

Dungeness Harvest Financial Assumptions

	% of Gross Revenue
Variable Costs	
Crew	15.0%
Fuel/Bait/Food	12.0%
Other Variable Costs	5.0%
<i>Total Variable Costs</i>	32.0%
<i>Total Variable Costs less Crew</i>	17.0%
Marginal Profit	68.0%
 Estimated % of Variable Costs Spent Locally (excl. Crew)	 80%

1
2 These assumptions indicate potential crew losses account for 15 percent
3 of the gross or ex-vessel value of the harvest decline. Variable costs are
4 assumed to account for 17 percent of the gross loss and 80 percent of
5 those variable expenditures are made with Southeast Alaska businesses.
6

7 It is assumed that marginal profit to permit holders accounts for 68
8 percent of the gross loss.
9

10 These losses are applied to the predicted annual decline in the Dungeness
11 harvest from Glacier Bay. These future annual losses are then reduced to
12 a present value (see Appendix 1), providing a single lump-sum
13 measurement of losses to permit holders, crew and support businesses.
14

15 Table 4.4 provides the assumptions used to estimate losses associated
16 with processing Glacier Bay Dungeness. As with other fisheries, the
17 approach used is to identify average costs and marginal profits for the
18 broad categories of products produced from Glacier Bay Dungeness.
19 Average costs and profits are calculated by weighting the data on the
20 share of total production accounted for by each product type.
21

22 Plant labor is assumed to account for an average of 23 cents per net
23 pound, or about 21 cents per gross pound, based on an average recovery
24 rate of 92 percent. Therefore, loss to crew is equal to 21 cents for each
25 gross pound the Glacier Bay harvest declines.
26

27 It is assumed that an average of 55 percent of variable costs, excluding
28 labor, are spent in Southeast Alaska. In this case, "other variable costs"
29 does include freight. Movement of crab (as well as salmon, halibut and
30 other products) from Gustavus to Juneau by air was an important
31 revenue source for at least one business.
32

33 On a net poundage basis, variable costs total about 17 cents and, on a
34 gross weight basis, about 16 cents (based on 92 percent recovery).
35 Therefore, annual losses to processing support businesses are estimated
36 at 16 cents for each pound that the Glacier Bay harvest declines.
37
38

Table 4.4

Dungeness Processor Financial Assumptions

Dollars per Finished Pound				
	<i>Weighted Average</i>	<i>Live</i>	<i>Whole Cooked</i>	<i>Sections</i>
Variable Costs				
Labor	0.23	0.15	0.30	0.35
Packaging	0.12	0.12	0.12	0.10
Other Variable Costs	0.19	0.29	0.08	0.08
Total Variable Costs	0.53	0.56	0.50	0.53
<i>Variable Costs less Labor</i>	0.30	0.41	0.20	0.18
Margin (\$/Net lb.)	0.89	1.00	0.75	0.90
Recovery Rate	92%	100%	90%	60%
Margin (\$/Gross lb.)	0.82	1.00	0.68	0.54
Production Share	100%	50%	40%	10%
Est. % of Variable Costs Spent Locally (excl. Labor)	55%	70%	40%	40%

Potential losses to processing plant owners are estimated at 89 cents per net pound, or approximately 82 cents per gross pound. In other words, for every pound that the Glacier Bay harvest declines, it is estimated that processors will lose 82 cents in marginal profits.

Present Value of Future Losses

Tables indicating future annual net losses to Dungeness fishermen not bought out, processors and other affected groups are provided in the appendix. Based on discount rates of 5.3 percent and 3.0 percent, the total present value of all losses is estimated at \$7.1 million to \$11.4 million. Table 4.5 provides the net present value of losses for each affected group.

Table 4.5

**Present Value of Potential Future
Dungeness Fishery Losses
(3.0 Percent and 5.3 Percent Discount Rates)**

<i>Harvest-Related Totals</i>	3.0%	5.3%
Loss to FNBO*	\$1,866,000	\$1,161,000
Loss to Vessel Crew	1,222,000	760,000
Loss to Harvest Support Businesses	1,108,000	689,000
Subtotal	\$4,197,000	\$2,610,000
<i>Processing-Related Totals</i>		
Loss to Processors	4,577,000	2,847,000
Loss to Processor Employees	1,035,000	644,000
Loss to Processing Support Businesses	1,363,000	848,000
Lost Fish Tax Revenue	244,000	152,000
Subtotal	\$7,220,000	\$4,491,000
Grand Total	\$11,416,000	\$7,101,000

*Fishermen not bought out.

Actual Losses in the Dungeness Fishery

Though the Dungeness fishery is not currently managed under a quota system, ADF&G fishery managers indicate some type of harvest limit or quota system is very likely in the near future. Managers further state that loss of Glacier Bay will affect Dungeness management, though at this point it is not possible to predict how.²⁷

From an impact assessment perspective, opportunity is very limited for fishermen not bought out and processors to replace the Glacier Bay resource with harvests from other nearby waters, regardless of the Southeast region's ability to substitute for the lost Glacier Bay harvest. From a more regional perspective, it is noteworthy that all productive Dungeness grounds in Southeast are now fished. Loss of Glacier Bay will increase competition in other productive areas and will affect other, non-Glacier Bay fishermen.

It is also important to note that the infrastructure built around the Beardslee Dungeness harvest cannot easily be adapted to harvest from waters outside the Bay. Most of the boats fishing in the Bay were not tanked and deliveries to processors were made on a daily basis. Processors were equipped to deal with a fairly steady supply of crab rather than large volumes at once.

Finally, regardless of individual fishermen's ability to replace their lost Glacier Bay harvest, the commercial value of the Glacier Bay Dungeness resource has been reduced to zero. Even if future management of the Dungeness fishery does not fully reflect the loss of the Glacier Bay resource, the commercial fishing industry and the State of Alaska have lost that commercial value. Therefore, the potential losses presented in Table 4.5 represent actual losses for present and future participants in the Dungeness fishery.²⁸

²⁷ Personal communication with Doug Woodby, ADF&G biologist, Juneau, May 16, 2000.

²⁸ During the draft review process it was noted that sea otter predation of Dungeness crab is increasing in the Icy Strait area. Because of this, it has been suggested that the Glacier Bay Dungeness harvest would

Chapter V. Losses in the Salmon Troll Fisheries

Overview of the Fishery

The salmon power troll and hand troll fisheries are among the largest in the state in terms of number of permits. Combined, these two fisheries accounted for 2,376 salmon permits in 1998, 20 percent of the statewide total. In 1998, power trollers accounted for 70 percent of permits fished and 94 percent of harvest poundage in the Southeast Alaska salmon troll fisheries.

- In 1998, 967 power troll permits were issued and 732 were fished. Average earnings in the power troll fishery in 1998 were \$16,111 per permit fished.
- In 1998 1,409 hand troll permits were issued but only 304 were fished. Average earnings were \$2,942 per permit fished.

The hand troll fishery was limited in 1980. Participation, at just 22 percent, is among the lowest in the state for salmon fisheries, but this is to be expected given the history of the fishery. There has always been a fleet of dedicated handtrollers with respectable catch rates and earnings, but many of the initial permit holders took a more casual approach.

Prior to limited entry in 1980, many sport fishermen in Southeast Alaska applied for salmon hand troll permits. These casual handtrollers used sport gear and simply retained their excess sport harvest to sell as commercial catch. In the three years prior to limited entry, participation was as high as 2,600 permits fished, but the average season harvest for the fishery was slightly under 1,500 pounds. When entry was limited, catch history was taken into account and many of the permits issued to casual handtrollers were non-transferable. This has resulted in fairly heavy attrition among the handtroll fleet, as many permits are not salable when their owners retire from the fishery. Since 1980, the number of permits fished has dropped from 1,667 to just 304 in 1998.

Entry to the power troll fishery was limited in 1974. Permits were awarded on the basis of catch history in the fishery prior to that date. Participation in terms of permits fished ranged between 76 percent and 88 percent between 1989 and 1998 and was steady at 76 percent over the last three years of that period.

have declined sharply in the future if the Bay had remained open to commercial fishing. Further, it has been suggested that the assessment of economic losses associated with closure of Glacier Bay should reflect this possible decline in the Dungeness resource. The economic assessment does not reflect this possibility, in part because of the difficulty in predicting what the impact of sea otter predation might be, but primarily because the assessment measures losses in perpetuity and therefore should not be influenced by short term or cyclical events affecting the condition of the resource.

Historical Harvest in Glacier Bay

Data is not available on past salmon harvests in Glacier Bay. Glacier Bay is included in Area 11400, an area that encompasses productive trolling grounds outside of Glacier Bay. The Glacier Bay troll fishery is predominantly a winter king fishery. Estimates have been made about the proportion of the total Area 114 king harvest that has come from the Bay. Based on discussions with fishermen and processors, an estimated 20 percent of the king harvest from Area 114 has come from Glacier Bay in past years. This estimate applies for both the power and hand troll harvests.

Table 5.1

Area 11400 Power Troll Chinook Harvest And Estimated Glacier Bay Harvest (pounds)

	Area 114	Glacier Bay
1989	157,154	31,431
1990	188,749	37,750
1991	222,686	44,537
1992	191,351	38,270
1993	138,817	27,763
1994	91,385	18,277
1995	60,218	12,044
1996	36,324	7,265
1997	36,593	7,319
1998	46,035	9,207
89-98 Ave.	116,931	23,386

Source: Area 114 data from ADF&G. Glacier Bay data are McDowell Group estimates.

Table 5.2

Area 11400 Hand Troll Chinook Harvest And Estimated Glacier Bay Harvest (pounds)

	Area 114	Glacier Bay
1989	47,348	7,102
1990	58,828	8,824
1991	82,544	12,382
1992	57,099	8,565
1993	38,604	5,791
1994	17,547	2,632
1995	11,302	1,695
1996	7,596	1,139
1997	8,574	1,286
1998	8,072	1,211
89-98 Ave.	33,751	5,063

Source: Area 114 data from ADF&G. Glacier Bay data are McDowell Group estimates.

1
2 In Table 5.3, the Glacier Bay harvest is divided into annual harvest in
3 areas that remain open to lifetime access permit holders and areas that
4 area closed to all commercial fishing. Again this determination is
5 subjective, and based on estimates provided by fishermen active in the
6 Glacier Bay power troll fishery. The estimates of closed versus open area
7 harvests presented in Table 5.3 are based on the assumption that 20
8 percent of the historical harvest has come from areas now closed to
9 commercial fishing. Certain areas of the Bay that are closed to other
10 fishermen will remain open for winter king fishing. But apparently very
11 productive areas, such as Hugh Miller Inlet, are closed.
12

13 Value estimates are based on the Area 114 average ten-year ex-vessel
14 price, plus a price adjustment of 22 percent. This upward adjustment is
15 intended to capture the higher-than-average prices paid for winter troll-
16 caught kings and the fact that an unusually high proportion of the Glacier
17 Bay harvest is comprised of white kings, which now draw a premium on
18 the market. The 22 percent adjustment was derived from the difference
19 between the average ex-vessel value of the Area 114 harvest overall and
20 the average value of the winter harvest in the same area.

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Table 5.3
Estimated Glacier Bay Power Troll Salmon Harvest
1989 to 1998

Total Est. Harvest	Pounds	Value(\$)	Value (99\$)
1989	31,431	\$82,858	\$110,230
1990	37,750	101,628	127,335
1991	44,537	122,257	146,511
1992	38,270	106,418	123,352
1993	27,763	64,175	72,191
1994	18,277	46,997	51,751
1995	12,044	29,238	31,291
1996	7,265	16,509	17,191
1997	7,319	17,422	17,879
1998	9,207	10,673	10,811
1989-98 Ave.	23,386	\$41,633	\$70,854

Harvest in Closed Areas

	Pounds	Value(\$)	Value (99\$)
1989	6,286	\$16,572	\$22,046
1990	7,550	20,326	25,467
1991	8,907	24,451	29,302
1992	7,654	21,284	24,670
1993	5,553	12,835	14,438
1994	3,655	9,399	10,350
1995	2,409	5,848	6,258
1996	1,453	3,302	3,438
1997	1,464	3,484	3,576
1998	1,841	2,135	2,162
1989-98 Ave.	4,677	\$11,963	\$14,171

Harvest in Open Areas

	Pounds	Value(\$)	Value (99\$)
1989	25,145	\$66,286	\$88,184
1990	30,200	81,303	101,868
1991	35,630	97,806	117,209
1992	30,616	85,134	98,681
1993	22,211	51,340	57,753
1994	14,622	37,598	41,401
1995	9,635	23,390	25,033
1996	5,812	13,207	13,753
1997	5,855	13,938	14,303
1998	7,366	8,538	8,649
1989-98 Ave.	18,709	\$47,854	\$56,683

Source: McDowell Group estimates.

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Table 5.4

**Estimated Glacier Bay Hand Troll Salmon Harvest
1989 to 1998**

Total Est. Harvest	Pounds	Value(\$)	Value (99\$)
1989	7,102	\$18,768	\$24,968
1990	8,824	25,202	31,577
1991	12,382	36,057	43,210
1992	8,565	25,266	29,286
1993	5,791	14,200	15,973
1994	2,632	7,180	7,906
1995	1,695	4,366	4,673
1996	1,139	2,747	2,860
1997	1,286	3,248	3,333
1998	1,211	2,739	2,774
1989-98 Ave.	5,063	\$8,535	\$16,656

Harvest in Closed Areas

	Pounds	Value(\$)	Value (99\$)
1989	1,420	\$3,754	\$4,994
1990	1,765	5,040	6,315
1991	2,476	7,211	8,642
1992	1,713	5,053	5,857
1993	1,158	2,840	3,195
1994	526	1,436	1,581
1995	339	873	935
1996	228	549	572
1997	257	650	667
1998	242	548	555
1989-98 Ave.	1,013	\$2,795	\$3,331

Harvest in Open Areas

	Pounds	Value(\$)	Value (99\$)
1989	5,682	\$15,014	\$19,974
1990	7,059	20,162	25,262
1991	9,905	28,846	34,568
1992	6,852	20,213	23,429
1993	4,632	11,360	12,779
1994	2,106	5,744	6,325
1995	1,356	3,493	3,738
1996	912	2,197	2,288
1997	1,029	2,598	2,667
1998	969	2,191	2,219
1989-98 Ave.	4,050	\$11,182	\$13,325

Source: McDowell Group estimates.

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9

Financial Assumptions

Potential losses to permit holders, crew, processors and support businesses are based on the assumptions shown in tables 5.5 through 5.7.

Table 5.5

Power Troll Harvest Financial Assumptions

	% of Gross Revenue
Variable Costs	
Crew	7.5%
Fuel/Bait/Food	12.0%
Other Variable Costs	3.0%
Taxes	4.0%
<i>Total Variable Costs</i>	26.5%
<i>Total Variable Costs less Crew</i>	19.0%
Marginal Profit	73.5%
Estimated % of Variable Costs Spent Locally (excl. Crew)	75%

Though the power troll fishery norm is 15 percent for crew share, that figure has been reduced by half to account for the fact that during the winter most trollers do not fish with crew. The hand troll crew share is still lower, given that most hand trollers do not fish with crew at all. Marginal profit earned for power troll permit holders is estimated at 73.5 percent of ex-vessel and 76 percent for hand troll.

Table 5.6

Hand Troll Harvest Financial Assumptions

	% of Gross Revenue
Variable Costs	
Crew	5.0%
Fuel/Bait/Food	10.0%
Other Variable Costs	5.0%
Taxes	4.0%
<i>Total Variable Costs</i>	24.0%
<i>Total Variable Costs less Crew</i>	19.0%
Marginal Profit	76.0%
Estimated % of Variable Costs Spent Locally (excl. Crew)	90%

Processing labor is assumed to account for an average of 8 cents per net pound, and the same on a per gross pound basis (assuming recovery of 98 percent).

It is assumed that an average of 54 percent of variable costs, excluding labor, are spent in Southeast Alaska. On a net poundage basis, variable costs total about 32 cents, and on a gross weight basis, about 31 cents (based on 98 percent recovery). Annual losses, therefore, to processing support businesses are estimated at 31 cents for each pound that the Glacier Bay harvest declines.

Potential losses to processing plant owners are estimated at 80 cents per net pound, or approximately 78 cents per gross pound.

Table 5.7

King Salmon Processor Financial Assumptions

Dollars Per Finished Pound			
	<i>Weighted Average</i>	<i>Fresh</i>	<i>Frozen</i>
Variable Costs			
Labor	0.08	0.07	0.10
Packaging	0.11	0.12	0.07
Other Variable Costs	0.13	0.15	0.08
Total Variable Costs	0.32	0.34	0.25
<i>Variable Costs less Labor</i>	0.24	0.27	0.15
Margin (\$/Net lb.)	0.80	0.90	0.50
Recovery Rate	98%	100%	92%
Margin (\$/Gross lb.)	0.79	0.90	0.46
Production Share	100%	75%	25%
Est. % of Variable Costs Spent Locally (excl. Labor)	54%	55%	50%

Present Value of Future Losses

Tables indicating potential future annual losses to trollers, processors and other affected groups are provided in the appendix. Based on discount rates of 5.3 percent and 3.0 percent, the present value of all potential power troll-related losses is estimated at \$1.1 million to \$2.0 million. Potential losses associated with hand troll are estimated at about \$200,000 to \$400,000. Table 5.8 provides the present value of losses for each affected group.

Table 5.8

**Present Value of Potential Future Troll Fishery Losses
(3.0 Percent and 5.3 Percent Discount Rates)**

<i>Harvest-Related Totals</i>	Power Troll @ 3.0%	Hand Troll @ 3.0%	Power Troll @ 5.3%	Hand Troll @ 5.3%
Permit Holders	\$1,165,000	\$232,000	\$627,000	\$115,000
Vessel Crew	119,000	15,000	64,000	8,000
Harvest Support Businesses	226,000	52,000	122,000	26,000
Subtotal	\$1,510,000	\$299,000	\$812,000	\$149,000
<i>Processing-Related Totals</i>				
Processors	382,000	83,000	206,000	44,000
Processor Employees	36,000	8,000	19,000	4,000
Processing Support Businesses	62,000	14,000	34,000	7,000
Fish Tax Revenue	48,000	9,000	26,000	5,000
Subtotal	\$528,000	\$113,000	\$284,000	\$60,000
Grand Total	\$2,038,000	\$412,000	\$1,096,000	\$209,000

Actual Losses in the Troll Fisheries

Eventual loss of the troll fishery in Glacier Bay will not affect Southeast region management of the king salmon fishery. The Glacier Bay troll fishery is a winter fishery. Since 1995 the winter troll fishery has been managed with a not-to-exceed harvest level of 45,000 fish. However, since 1995, the cap has never been reached. The 1995–1998 harvest averaged 20,000 chinook, including a harvest of 33,000 fish in 1998. The 1999 harvest totaled 31,000 chinook.²⁹

It should be noted that the winter harvest of chinook in Glacier Bay and elsewhere in Southeast Alaska has been affected by Pacific Salmon Treaty and internal allocation issues. The chinook fishery in Southeast Alaska has been constrained by conservation efforts in Canada and Washington. In addition, because the winter chinook harvest is subtracted from the following years' troll quota to establish the summer quota, efforts have been made to reduce the winter harvest (including moving back the season start from Oct. 1 to Oct. 11). If these management constraints and allocation issues ease in the future, the harvest of chinook in Southeast will increase, including the winter harvest. The implication regarding Glacier Bay is that historical harvest data for Area 114 (which includes Glacier Bay) may understate the actual long-term production potential for the Bay. While this may be a valid point, no attempt has been made in

²⁹ *Management Plan and Regulatory Guide For the Southeast Alaska/Yakutat Winter Troll Fishery*, Regional Information Report No. 1J99-32. Alaska Department of Fish and Game, September 1999.

1 this study to consider the economic implications of what might have been
2 a long-term increase in the chinook harvest from the Bay.
3

4 Similar to the halibut fishery, losses suffered by trollers will result from
5 increased costs and some possible reduction in harvest as fishermen seek
6 to replace their lost Glacier Bay harvest. Permit holders excluded from
7 the Bay will lose the benefit of their experience in Glacier Bay and shift
8 their effort to other areas where they may have less experience.
9 Fishermen with lifetime access have lost productive grounds in the Bay,
10 particularly Hugh Miller and Geikie Inlets, as well as areas in Muir Inlet
11 and the Beardslee Islands (based on anecdotal information). Perhaps
12 more important, with the loss of areas such as Hugh Miller and Geikie,
13 trollers have lost sheltered waters – waters that could be fished when
14 weather prohibited fishing in more exposed areas of the Bay. Because of
15 this, fishermen may choose to reduce their fishing effort in Glacier Bay.
16 Though supporting data is not available, fishermen have also reported
17 that the Glacier Bay king salmon harvest includes a disproportionate
18 percentage of white kings. Fishermen report that some processors pay a
19 25 cent-per-pound premium for white kings.
20

21 To develop a measure of actual losses to permit holders, the following
22 assumptions about declining productivity have been made:
23

- 24 • Fishermen will initially replace only 50 percent of their past Glacier
25 Bay harvest.
- 26 • Over a period of about ten years, fishermen's effort to replace their
27 past Glacier Bay harvest will be more successful and level off at 80
28 percent of the historical harvest.
- 29 • Variable costs will double (from 15 percent to 30 percent of ex-vessel
30 value) initially to replace that harvest.
- 31 • Variable costs will decline slowly and finally level off at about 20
32 percent after approximately six years.
33

34 Based on these assumptions, the present value of future losses to power
35 troll permit holders totals approximately \$300,000 to \$450,000. The
36 present value of future losses to hand troll permit holders totals
37 approximately \$70,000 to \$110,000 (based on discount rates of 5.3 percent
38 and 3.0 percent, respectively).³⁰ This estimate reflects the loss to all
39 Glacier Bay fishermen, including those with lifetime access and those
40 without lifetime access. It does not include potential losses to fishermen
41 who have never fished in Glacier Bay but could experience some
42 dislocation effects (increased competition from fishermen dislocated from
43 the Bay).
44

45 Crew could suffer losses as a result of reduced crew-share basis. Crew
46 shares are usually based on total ex-vessel value less food, fuel and bait.
47 Because more fishing effort will be required to fill quota shares formerly
48 taken in Glacier Bay, crew shares will decline. Based on the same
49 assumptions made for predicting losses to permit holders, the present
50 value of losses to crew in the power troll fishery would be approximately

³⁰ Calculations are provided in the appendix under "Power and Hand Troll Fishery Annual and Total Losses."

1 \$25,000 to \$35,000. Losses to crew in the hand troll fishery would be
2 approximately \$4,000 to \$6,000.³¹
3

4 To the extent that fishermen reduce their winter troll fishery effort
5 because of the closures in Glacier Bay, processors could also suffer losses.
6 Based on the assumptions listed above, processor losses associated with
7 reduced power troll harvests have a present value of between \$78,000 and
8 \$118,000, based on discount rates of 5.3 percent and 3.0 percent,
9 respectively. Processor losses associated with the hand troll fishery range
10 between \$17,000 and \$25,000.
11

12 Businesses providing goods and services to fishermen could experience
13 increased business sales because fishermen could actually be spending
14 more money on fuel, bait and gear to catch the same volume of fish.
15 Businesses providing goods and services to processors could also
16 experience some losses, however, those losses would probably be
17 minimal.
18

19 As in the halibut fishery, estimates of troll fishery losses are based on
20 subjective assumptions. The criteria used to determine eligibility for
21 compensation should reflect the uncertainty of the estimated losses.
22
23

³¹ The State of Alaska study of troll fisheries losses predicted no losses to crew.

Chapter VI. Losses in the Groundfish Fishery

Profile of the Fishery

Management of the directed Pacific cod fishery in Southeast Alaska inside waters is handled by Alaska Department of Fish and Game (ADF&G). Access to the state-managed Pacific cod resource is not limited and the fishery remains open year-round. Fishermen holding a miscellaneous finfish permit can fish for Pacific cod using any gear that is legal for groundfish. The department sets an annual quota of 1,250,000 pounds for Southeast Alaska, but ADF&G staff report this quota has never been reached. Consequently, the state-managed fishery remains open year-round and the quota is simply “refreshed” on January 1 of each year. Total 1998 Pacific cod harvest in the state-managed directed fishery was approximately 600,000 pounds.

ADF&G staff report that the primary use of Southeast Alaska Pacific cod is for bait, as the fish typically carry a heavy parasite load of worms. However, there is some use of the species as a food where suitable fish can be found. A processor in Hoonah reports that Glacier Bay Pacific cod are suitable for the food market, as they tend to carry fewer worms than Pacific cod elsewhere in the region.³²

This raises a question of whether Glacier Bay fisheries closure have preempted an emerging fishery for food-market Pacific cod in the Bay. In 1998, Pacific cod landings from Glacier Bay proper doubled from the previous year, accounting for 100,000 of 600,000 pounds landed in Southeast Alaska.

There are three groundfish statistical areas that cover Glacier Bay waters. Statistical areas 365804 and 365801 cover Icy Strait and a portion of Cross Sound. The northernmost boundary line of both areas is at the latitude of Beardslee entrance in Glacier Bay. The boundary between these two areas bisects the entrance of Glacier Bay, an area measuring approximately seven miles by five miles in size. While a small portion of harvest from these statistical areas might be attributed to this area of Glacier Bay proper, most is from areas outside of the park. The southernmost boundary line for statistical area 365830 is at latitude 58 degrees and 30 minutes, approximating Beardslee entrance in Glacier Bay. This statistical area encompasses most of Glacier Bay proper and includes no waters that are outside the boundaries of the park.

In 1998, a total of 292 miscellaneous finfish permits were fished in Southeast Alaska inside waters. Most permits (236) were fished in Northern Southeast, while 56 permits were fished in southern Southeast.

³² Dave Bowen, BuyNPack Seafoods, personal communications, July 12, 2000. According to NPS Glacier Bay personnel, there is no scientific evidence for lower parasite loads in Glacier Bay proper Pacific cod.

Table 6.1

**Pacific Cod Harvest in Icy Strait, 1989-98
(pounds)**

	Area 365830	Area 365801	Area 365804	Total
1989	9,364	16,124	4,237	29,725
1990	1,980	24,084	1,347	27,411
1991	*	26,272	2,900	29,172
1992	5,678	11,032	11,974	28,684
1993	2,803	9,276	12,034	24,113
1994	*	5,392	6,503	11,895
1995	3,955	4,310	5,266	13,531
1996	13,432	11,047	12,220	36,699
1997	48,593	6,164	18,313	73,070
1998	100,270	3,220	14,932	118,422

Source: Alaska Commercial Fisheries Entry Commission

* note: some data are confidential

Historical Harvest in Glacier Bay

Between 1989 and 1998, the Pacific cod harvest from Glacier Bay, Area 365830, averaged 23,000 pounds annually with an average value of about \$10,000 (the average does not include 1991 and 1994 data which is non-disclosable). The rockfish harvest in the same area average about 1,500 pounds for the years for which data is available, with an average value of about \$600.

Between 1995 and 1998, the longline effort in Glacier Bay increased substantially, as did the Pacific Cod harvest. As an emerging fishery, it is assumed that the '96 through '98 harvest serves as a better proxy for future harvests than the ten years period between 1989 and 1998. In predicting losses, the 1996 to 1998 average harvest values are used to predict future losses. The average annual harvest for those three years was 54,000 pounds of Pacific Cod and 1,800 pounds of rockfish, values at \$24,500 and \$700, respectively. Glacier Bay is now closed to groundfish fishing (though the retention of groundfish as by-catch is allowed in the halibut fishery). The baseline annual groundfish loss is set at approximately \$25,000.

Table 6.2

**Groundfish Effort and Harvest in Glacier Bay, 1989-98
Area 365830**

Pacific Cod Longline					
	Count of People	Count of Vessels	Total Pounds	Total Estimated Gross Earnings	Gross Earnings 99\$
1989	9	9	9,364	3,039	4,043
1990	6	6	1,980	611	765
1991	2	2	*	*	
1992	4	4	5,678	2,336	2,708
1993	6	6	2,803	394	443
1994	3	3	*	*	
1995	6	6	3,955	1,124	1,203
1996	15	15	13,432	7,824	8,147
1997	18	15	48,593	20,983	21,533
1998	11	11	100,270	43,297	43,858
1989-98 ave.*	8	8	23,259	9,951	10,338
1996-98 ave.	15	14	54,098	\$24,035	\$24,513
Rockfish Longline					
1989	4	4	2,729	953	1,268
1990	6	6	584	259	324
1991	5	5	*	*	*
1992	3	3	*	*	*
1993	4	4	198	142	160
1995	2	2	*	*	*
1996	5	5	885	344	368
1997	11	10	899	325	338
1998	12	11	3,618	1,307	1,341
89-98 ave.*	5	5	1,273	476	543
96-98 ave.	9	9	1,801	\$659	\$683

*Averages exclude years for which data was not available to the McDowell Group due to confidentiality. According to NPS, the average Pacific cod harvest for the 1989-98 period was 19,000 pounds, including confidential ADF&G data made available to NPS for years 1991 and 1994. Also, according to the NPS, the average rockfish harvest for the 1989-98 period was 1,089 pounds, including confidential ADFG data for 1991, 1992, and 1995.³³

³³ NPS comments on the May 15, working draft of the *Glacier Bay Compensation Plan Economic Assessment*.

Financial Assumptions

Potential losses to permit holders, crew, processors and support businesses are based on the assumptions shown in Tables 6.3 and 6.4.

Table 6.3

Groundfish Harvest Financial Assumptions

	% of Gross Revenue
Variable Costs	
Crew	20.0%
Fuel/Bait/Food	10.0%
Other Variable Costs	5.0%
<i>Total Variable Costs</i>	35.0%
<i>Total Variable Costs less Crew</i>	15.0%
Marginal Profit	65.0%
Estimated % of Variable Costs Spent Locally (excl. Crew)	80%

These assumptions indicate that potential crew losses account for 20 percent of the gross or ex-vessel value of the harvest decline. Variable costs are assumed to account for 15 percent of the gross loss, and 80 percent of those variable expenditures are made with Southeast Alaska businesses.

It is assumed that marginal profit to permit holders accounts for 65 percent of the gross loss.

Table 6.4

Groundfish (Pacific Cod Only) Processor Financial Assumptions

	Dollars per Finished Pound		
	<i>Weighted Average</i>	<i>Fresh(fillet)</i>	<i>Bait</i>
Variable Costs			
Labor	0.43	0.45	0.05
Packaging	0.10	0.10	0.00
Other Variable Costs	0.10	0.10	0.00
Total Variable Costs	0.62	0.65	0.05
<i>Variable Costs less Labor</i>	0.19	0.20	0.00
Margin (\$/Net lb.)	1.91	2.00	0.10
Recovery Rate	0.34	30%	100%
Margin (\$/Gross lb.)	0.58	0.60	0.10
Production Share	100%	95%	5%
Est. % of Variable Costs Spent Locally (excl. Labor)	0.50	50%	50%

Processing labor is assumed to account for an average of 43 cents per net pound, and 15 cents on a per gross pound basis (assuming recovery of 34 percent).

It is assumed that an average of 50 percent of variable costs, excluding labor, are spent in Southeast Alaska. On a net poundage basis, variable costs total about 19 cents and on a gross weight basis, about 6 cents.

Potential losses to processing plant owners are estimated at \$1.91 per net pound, or approximately 58 cents per gross pound.

Present Value of Potential Future Losses

Based on discount rates of 5.3 percent and 3.0 percent, the total present value of all potential losses associated with the Glacier Bay groundfish fishery are estimated at \$1.2 million to \$2 million. Table 6.5 provides the present value of potential losses for each affected group.

Table 6.5

**Present Value of Future Groundfish Fishery Losses
(3.0 Percent and 5.3 Percent Discount Rates)**

<i>Harvest-related Totals</i>	3.0%	5.3%
Loss to Permit Holders	\$486,000	\$303,000
Loss to Vessel Crew	150,000	93,000
Loss to Harvest Support Businesses	90,000	56,000
Subtotal	\$726,000	\$452,000
<i>Processing Related Totals</i>		
Loss to Processors	924,000	575,000
Loss to Processor Employees	231,000	144,000
Loss to Processing Support Businesses	102,000	64,000
Lost Fish Tax Revenue	22,000	14,000
Subtotal	\$1,280,000	\$796,000
Grand Total	\$2,006,000	\$1,248,000

These potential losses are based on the average historical harvest for the years 1996 through 1998. If the years 1989 through 1998 are used as the historical baseline (resulting in a significantly lower annual baseline harvest – 23,000 pounds versus 54,000 pounds), potential losses are equal to 43 percent of the losses tabulated above.³⁴

Actual Losses in the Groundfish Fisheries

As indicated above, the ADF&G sets an annual quota of 1,250,000 pounds of Pacific Cod for Southeast Alaska, but this quota has never been reached. Total 1998 Pacific cod harvest in the state-managed directed fishery was approximately 600,000 pounds, therefore from a resource management perspective there is apparently sufficient resource to replace the lost Glacier Bay harvest.

However, predicting actual losses in the groundfish fishery in Glacier Bay is complicated by several factors. First, harvest data for several years during the 1989-98 period is not available to the study team due to data confidentiality restrictions. Second, based on fish ticket data and other information, the fishery was in a period of significant change. The harvest of Pacific cod from Glacier Bay increased more than seven-fold between 1996 and 1998, apparently the result of the development of market for skinless, boneless fillets. Finally, according to public input received by the study team, a portion of Glacier Bay harvest of Pacific cod for use as bait may not be recorded in fish ticket data. Therefore, data available from CFEC on the Pacific cod harvest may understate the actual harvest.

³⁴ The annual average of 23,000 pounds excludes confidential data for 1991 and 1994. If the 1989-98 average is actually 19,000 pounds including 1991 and 1994, as reported by the NPS, total potential losses are 35 percent of the losses presented in Table 6.5.

1
2 As with other fisheries, the actual losses in the groundfish fishery depend
3 on the ability of participants to replace their Glacier Bay harvest with
4 harvest from other waters. Again the study team must rely on anecdotal
5 information to address this question. While the primary use of Pacific
6 cod historically has been as bait, a processor in Hoonah reported that
7 Glacier Bay Pacific cod are suitable for the food market, as they tend to
8 carry fewer worms than Pacific cod elsewhere in the region. It has also
9 been reported that Glacier Bay Pacific cod are of larger-than-average size
10 and have unusually white flesh (which increases market appeal).³⁵ No
11 data is available to support the claim that Glacier Bay Pacific cod resource
12 is unique in its suitability for the food market. Nevertheless, the apparent
13 success of the Hoonah processor in finding a market for Glacier Bay
14 Pacific cod is instructive.

15
16 While there is little doubt that sufficient Pacific cod exist outside Glacier
17 Bay to fully replace the lost Glacier Bay harvest, the issue is apparently
18 more one of productivity and infrastructure development. Anecdotally,
19 it has been reported that Glacier Bay offered significantly more
20 productive Pacific cod grounds than Icy Strait (with Glacier Bay offering
21 two to three times the harvest for the same effort). Equivalent grounds
22 apparently exist in Chatham Strait south of Freshwater Bay. However,
23 fishermen that harvested Glacier Bay Pacific cod for the food market
24 (including several Haines fishermen) have not targeted that more distant
25 resource, resulting in a break in the supply needed to meet the newly
26 developed food market. In this case, losses associated with Glacier Bay
27 closure would depend on the cost associated with redeveloping the
28 supply network needed to once again meet the new demand in the food
29 market. It is not possible, however, to predict the amount of the losses.

30
31 In any case, most of the measured potential losses revolve around the
32 operations of one processor. Measuring that processor's losses will
33 require a detailed audit of that business's operations and finances, an
34 exercise that will occur after eligibility criteria have been developed and
35 application for compensation is made.

36
37 That being the case, no further attempt to measure actual losses is made
38 in this assessment. The range of potential losses summarized in Table 6.5
39 (and associated narrative) serve as a guide in understanding the potential
40 losses, but actual determination of losses must occur after eligibility
41 criteria are defined and an audit of the key affected business is
42 conducted.

43
44
45

³⁵ Dave Bowen, BuyNPack Seafoods, personal communication, July 12, 2000.

Chapter VII. Losses in the King Crab Fishery

Overview of the Fishery

Six limited entry permit types allow commercial access to the king crab resource in Southeast Alaska. Three permit types are specific to one or more species of king crab and three permits are specific to one or more king crab species plus Tanner crab.

Dedicated King Crab Permits

Eleven limited entry permits are specific to king crab only, and seven of those permits are interim use. Generally, there is insufficient participation in these fisheries to track harvest and value data by permit type. Between 1989 and 1998, total disclosable landings for these permit types amount to 45,000 pounds. When there are less than four permits fished in a harvest year, the Commercial Fisheries Entry Commission considers the data confidential.

Entry to the king crab pot fisheries (and combination fisheries) was limited in 1984. Fishermen were awarded the right to catch king crab species based on their catch history for each species between 1975 and 1983, on their investment in and economic dependence on the fishery and on consistency of participation during qualifying years.

- K19A (red king, blue king crab pot gear). Six permits were issued in 1998, though none were fished. There are five interim permits and one permanent permit as of 1998.
- K29A (red king, blue king and brown king crab pot gear). There are only two permits for this fishery, one is permanent and one is interim use. One permit was fished in 1998.
- K39A (brown king crab pot gear). There are two permanent permits and one interim-use permit in this fishery as of 1998. One permit was fished in 1998.

Combination King/Tanner Permits

In recent years, Tanner crab has provided the bulk of value to holders of combination crab permits in Southeast Alaska. From 1991 through 1998, Tanner crab provided an average 79 percent of gross earnings for combination permits, ranging from 70 percent to 90 percent during the eight-year period.

- K49A (red king, blue king and Tanner crab pot gear). In 1998, eight permanent and 20 interim permits were issued. Twenty-seven (27) permits were fished in 1998, with average earnings of \$52,378 per permit.
- K59A (brown king, Tanner crab pot gear). In 1998, zero permanent and four interim permits were issued. Three permits were fished in

1998, but average earnings are not disclosable because participation was less than four permits.

- K69A (brown king, blue king, red king and Tanner crab pot gear). In 1998, 14 permanent and 37 interim permits were issued and all 51 permits were fished in 1998, with average earnings of \$72,957.

Historical Harvest in Glacier Bay

In the recent past Glacier Bay has produced a small volume of king crab. For the 1989 to 1989 period, data indicates that the harvest has averaged about 2,700 pounds annually, with an average ex-vessel value of about \$11,000 (the value estimate is based on the regional average ex-vessel price paid for king crab). All of Glacier Bay is now closed to commercial king crab fishing.

Table 7.1

Glacier Bay King Crab Harvest 1982 to 1998 (pounds and estimated value)

	Permits	Landings	Total Pounds	Total Estimated Gross Earnings	Gross Earnings in 99\$
1982	13	18	40,414	*	*
1983	7	10	18,263	*	*
1984	10	22	13,341	*	*
1985	4	4	1,216	*	*
1986	*	*	*	*	*
1987	5	7	729	*	*
1988	4	6	883	*	*
1989-94	*	*	*	*	*
1995	4	5	3,041	12,772	13,669
1996	4	4	3,720	15,847	16,502
1997	4	5	2,361	8,736	8,965
1998	*	*	*	*	*
89-98 ave.*			2,668	\$10,814	\$11,320

*Data for 1989-94 and 1998 was available in aggregate only. Annual average is based on this seven-year total divided by seven.

Financial Assumptions

Potential losses to permit holders, crew, processors and support businesses are based on the assumptions shown in Tables 7.2 and 7.3.

Table 7.2

King Crab Harvest Financial Assumptions

	% of Gross Revenue
Variable Costs	
Crew	28.0%
Fuel/Bait/Food	10.0%
Other Variable Costs	3.0%
<i>Total Variable Costs</i>	41.0%
<i>Total Variable Costs Less Crew</i>	13.0%
Marginal Profit	59.0%
Estimated % of Variable Costs Spent Locally (excl. Crew)	80%

These assumptions indicate that potential crew losses account for 28 percent of the gross or ex-vessel value of the harvest decline. Variable costs are assumed to account for 13 percent of the gross loss and that 80 percent of those variable expenditures are made with Southeast Alaska businesses. These assumptions are identical to those made for the Tanner pot fishery.

It is assumed that marginal profit to permit holders accounts for 59 percent of the gross loss.

Table 7.3

King Crab Processor Financial Assumptions

	Dollars Per Finished Pound		
	Weighted Average	Fresh	Frozen
Variable Costs			
Labor	0.39	0.40	0.10
Packaging	0.15	0.15	0.10
Other Variable Costs	0.05	0.05	0.05
Total Variable Costs	0.58	0.60	0.25
<i>Variable Costs less Labor</i>	0.20	0.20	0.15
Margin (\$/Net lb.)	1.73	1.75	1.25
Recovery Rate	0.62	60%	100%
Margin (\$/Gross lb.)	1.06	1.05	1.25
Production Share	100%	95%	5%
Est. % of Variable Costs Spent Locally (excl. Labor)	0.49	50%	30%

Processing labor is assumed to account for an average of 39 cents per net pound, and 24 cents on a per gross pound basis (assuming average recovery of 62 percent).

It is assumed that an average of 49 percent of variable costs, excluding labor, are spent in Southeast Alaska. On a net poundage basis, variable costs total about 20 cents and on a gross weight basis, about 12 cents.

Potential losses to processing plant owners are estimated at \$1.73 per net pound, or approximately \$1.06 per gross pound.

Present Value of Potential Future Losses

Based on discount rates of 5.3 percent and 3.0 percent, the total present value of all potential losses associated with the Glacier Bay King crab fishery are estimated at \$290,000 to \$466,000.

Table 7.4 provides the present value of potential losses for each affected group.

Table 7.4

Present Value of Potential Future King Crab Fishery Losses (3.0 Percent and 5.3 Percent Discount Rates)

<i>Harvest-related Totals</i>	3.0%	5.3%
Loss to Permit Holders	\$198,000	\$123,000
Loss to Vessel Crew	94,000	59,000
Loss to Harvest Support Businesses	35,000	22,000
Subtotal	\$327,000	\$204,000
<i>Processing Related Totals</i>		
Loss to Processors	96,000	60,000
Loss to Processor Employees	22,000	13,000
Loss to Processing Support Businesses	11,000	7,000
Lost Fish Tax Revenue	10,000	6,000
Subtotal	\$138,000	\$86,000
Grand Total	\$466,000	\$290,000

Actual Losses in the King Crab Fishery

The Southeast Alaska king crab fishery has experienced dramatic swings over the past two decades, as has the king crab harvest in Glacier Bay (ranging from a few hundred pounds to over 40,000 pounds). Region-wide, the golden king crab fishery collapsed in the early 1990s following a decade of harvests averaging about 800,000 pounds annually. Since about 1998, the fishery has been rebuilding with guideline harvest levels of 125,000, 250,000 and 400,000 pounds in the last three years. The red king crab harvest in Southeast is also in a rebuilding condition. There was no red king crab harvest in 1998; the 1999 harvest totaled 300,000 pounds.

1
2 Blue king crab account for a portion of the Glacier Bay king crab harvest.
3 Blue king's are taken incidentally in red king fisheries. Glacier Bay is one
4 of the few areas in Southeast where harvest of blue king crab is legal.
5

6 To measure potential losses, this assessment is based on the average
7 Glacier Bay king harvest for the period 1989 through 1998 (about 2,700
8 pounds). This period may or may not be representative of the long-term
9 king crab production potential of Glacier Bay. As the Southeast king crab
10 resource rebuilds, it is possible that the Glacier Bay harvest would
11 increase as well. To the extent that is true, this analysis may understate
12 actual losses.
13

14 Management action in response to closing Glacier Bay to commercial king
15 crab fishing is unlikely, given that the Bay harvest has been small and has
16 accounted for a very small percentage of the regional harvest (less than 1
17 percent). It is also true that Glacier Bay has apparently not been an
18 important source of king crab for fishermen in the recent past. Among the
19 four permit holders that fished king crab in Glacier Bay during the 1995
20 to 1997 period, the average annual harvest was about 750 pounds.
21

22 In any case, regardless of past importance of the king crab harvest or
23 individual fishermen's ability to replace their lost Glacier Bay harvest, the
24 commercial value of the Glacier Bay king crab resource has been reduced
25 to zero. Even if future management of the king fishery does not reflect the
26 loss of the Glacier Bay resource, the commercial fishing industry and the
27 State of Alaska have lost that commercial value (assuming little or no
28 migration of crab out of the Bay). From this perspective, the potential
29 losses presented in Table 7.4 represent actual losses for present and future
30 participants in the king crab fishery.
31
32

Chapter VIII. Indirect Losses to Communities

This study has provided estimates of losses suffered by commercial fishermen, crew, processors, their employees, and businesses that provide goods and services to fishermen and processors. Not yet estimated are the indirect economic effects that communities and individuals within communities could experience.

Indirect impacts stem from circulation of money through an economy. There are two types of indirect impacts: true indirect impacts, which stem from spending by businesses in support of their operations, and induced impacts, which stem from household spending. For example, indirect impacts occur when a seafood processor or commercial fishermen purchases supplies locally, such as fuel, gear or equipment, shipping services, etc. Induced impacts occur when an employee of a processing plant, for example, spends his or her payroll locally.

Most of the indirect impacts of commercial fishing restrictions in Glacier Bay have already been estimated. These include variable expenditures made by processors and fishermen in support of their operations (see “losses to support businesses” in the full working draft). Indirect impacts not yet identified include potential impacts on sales and property tax revenues to local governments. Also, not included are the induced impacts – losses to local economies from reduced purchases of goods and services by households directly affected by fishing restrictions.

To summarize, following is a list of some of the indirect and induced losses (other than those already estimated) that could occur in communities affected by commercial fishing restrictions in Glacier Bay.

- Reduced residential and commercial property valuations for households and businesses not directly involved in the Glacier Bay fisheries. (Losses to those involved in the fisheries have already been considered.)
- Reduced sales in businesses not directly involved in the Glacier Bay fisheries (in addition to that already predicted for those businesses providing goods and services directly to the fishing and processing industries).
- Reduced property tax revenues to local governments (resulting from declining processor or other business property assessments, as well as declining residential assessments).
- Reduced sales tax revenues to local governments.
- Reduced employment and income opportunities in the private and public sectors resulting from reduced business sales and tax revenues.

In the absence of compensation to individuals and businesses directly affected by Glacier Bay fishing restrictions, estimating these potential indirect and induced losses would be a relatively simple matter of applying a multiplier to the direct losses. Multipliers provide a measure of the total economic impact of adding or subtracting jobs or income from an economy.

1 However, in theory, if all directly affected parties are fully compensated for their
2 losses, then there would be no indirect or induced losses. This may be true from
3 a very broad geographic perspective, but it is not true from the local perspective.
4 Individuals and businesses receiving compensation are very unlikely to spend
5 compensation money in the same places and at the same time as if the loss had
6 not occurred. The challenge then is to predict indirect/induced losses to
7 communities, recognizing that compensation paid to fishermen, processors,
8 crew, support businesses and others will substantially – but not entirely –
9 mitigate the indirect and induced impact on communities.

12 **Multiplier Analysis**

14 In the absence of very detailed economic modeling data on the local economies
15 affected by Glacier Bay fishing restrictions, multipliers can be used to predict the
16 magnitude of indirect/induced impacts of the Glacier Bay commercial fisheries.
17 The actual multiplier effect of a commercial fishery on a community depends on
18 several factors, including the residency of the harvesting and processing labor
19 force, personal income generated by the fishery, and the ability of local
20 businesses to meet the service and supply needs of fishery participants.

22 Multipliers can measure indirect and induced employment or income. Neither of
23 these multipliers – even if available for the affected communities and fisheries –
24 would work well for this analysis. Employment losses, while likely to occur,
25 have not been measured in this study for those directly affected (therefore there
26 is no base to apply a multiplier). Income losses have been measured in this
27 study, however, the losses presented in the working draft are not purely income
28 losses. The losses include business sales and fish taxes, along with income losses
29 to fishermen, crew, processors and their employees.

31 Within the scope of this study, the best approach to measuring indirect and
32 induced community losses is to apply a reasonable multiplier to the direct losses
33 and make some adjustment to account for the fact that most of the losses will be
34 mitigated through compensation to directly affected parties. The analysis
35 indicates that losses to fishermen, crew, processors, employees and support
36 businesses could total \$20 million to \$35 million (depending on the discount
37 rate). Based on a multiplier of 1.5 (a generally accepted multiplier for
38 communities in Alaska) total losses could total \$30 million to \$52 million. This
39 total of direct, indirect, and induced losses represents total losses only if no
40 compensation is paid to directly affected parties.

42 However, because compensation will be given to directly affected parties, actual
43 indirect/induced losses to communities and other support businesses is
44 theoretically zero. In reality, there will be losses to specific communities because
45 the economic benefit stemming from expenditure of the compensation money
46 will be redistributed. For example, money that would have been spent in
47 Gustavus might now be spent in Juneau or Seattle. If it is arbitrarily assumed
48 that this redistribution affects about 30 percent of the compensation award,
49 losses to communities could total 30 percent of the potential indirect/induced
50 loss, or approximately \$3 million to \$5 million. At the same time, gains by other
51 communities (communities unaffected by Glacier Bay closures) could total \$3
52 million to \$5 million. Obviously, there is a great deal of uncertainty in this

analysis, however, it does provide some sense of the order-of-magnitude of the indirect losses to communities.³⁶

This analysis does not include any attempt to quantify the potential loss of economic development opportunity associated with commercial fishing restrictions in Glacier Bay. For example, eventual closure of the Bay will constrain long-term seafood industry-related investment, employment growth and tax-base expansion in Gustavus, as well as Pelican and Hoonah. However, predicting these losses for communities would create inequities in the economic assessment because loss of opportunity has not been measured for fishermen (including fishermen who have no history of fishing in the Bay but have lost the opportunity to do so in the future), processors or other businesses.

Distribution of Community Losses

While this analysis provides a very broad estimate of the collective indirect/induced losses to communities affected by commercial fishing restrictions in Glacier Bay, it does not provide any indication of the losses to any specific community. Actual compensation to communities would be based on specific qualifying criteria (which have not yet been defined) and would reflect the unique impacts of Glacier Bay fishing restrictions on each community.

Some data is available that reflects, in part, the relative importance of commercial fishing in Glacier Bay to various communities. The following table provides the number of fishermen in each fishery from each community that could qualify for lifetime access and the number of fishermen that have fished in Glacier Bay in recent years that do not qualify for lifetime access. As presented in the table, the number of halibut and Tanner fishermen qualifying for lifetime access should be accurate. Rather than lifetime access, the Dungeness data reflects the number of fishermen that qualified (according to fish ticket data) for buy-out and the number that did not. The data for trollers is the least accurate because it is based on landings during the qualifying years in all of Area 114, not just in Glacier Bay. It is likely that many of the trollers that qualify according to fish ticket data do not actually have the fishing history in the Bay to meet the NPS qualifying criteria for lifetime access.

Participation data does clearly indicate the comparatively high level of dependence of smaller communities on commercial fishing in Glacier Bay. For example, residents of Gustavus, a community with a population of 377 in 1999, hold 65 commercial fisheries permits potentially affected by Glacier Bay fishing restrictions (limitations with the salmon troll data notwithstanding). That's a permit-to-population percentage of 17 percent.³⁷ This measure does not include Gustavus-based crew or processors and their employees who rely on the Glacier

³⁶ For information on seafood industry multipliers in Alaska, see *The Alaska Fishing Industry: An Overview of State Expenditures and Economic Benefits*, House Research Agency Report 81-4, January 1982. Also see *Seafood Industry Sector Report*, Alaska Department of Commerce and Economic Development, May 1991, and *Tongass Land Management Plan Revision, Final Environmental Impact Statement, Part 2: Chapter 3, Economic and Social Environment*, USDA Forest Service, January 1997.

³⁷ The number of affected permits does not necessarily reflect the number of affected permit holders because one fishermen could hold permits in more than one fishery.

1 Bay harvest. (Gustavus has two processors that were heavily dependent on the
2 Glacier Bay Dungeness harvest, as well as other products).
3

4 In Hoonah, the proportion of affected permits to population is 16 percent
5 (Hoonah's population in 1999 was 877). Hoonah also has two processors with a
6 history of dependence on Glacier Bay fisheries.
7

8 In Pelican, a community of 137 residents, the percentage is 39 percent. Among
9 the communities most directly affected by fishing restrictions in Glacier Bay,
10 Pelican is the most economically dependent on commercial fishing and is
11 struggling to adjust to changes in the industry. Pelican's population has dropped
12 by 40 percent since 1992, falling from 233 residents to 137 in 1999, according to
13 Alaska Department of Labor data. This population loss is primarily the result of
14 declining fish processing activity.
15

16 Elfin Cove is the community with the highest proportion of qualifying permits to
17 population. That community of about 50 residents holds 42 potentially affected
18 permits, or 84 percent.
19

20 Other communities are also affected by fishing restrictions in Glacier Bay but on
21 a much smaller scale than Pelican, Hoonah and Gustavus. Affected permits as a
22 percentage of total population is 3 percent in Sitka, 2 percent in Haines and
23 Petersburg, and 1 percent in Juneau and Wrangell. All these communities also
24 have processors affected by the closures and restrictions.
25

26 This comparative analysis provides only one, partial measure of the relative
27 importance of Glacier Bay commercial fishing to communities. The analysis is
28 limited in its accuracy because most of the *potentially* affected permits are in the
29 salmon troll fishery and in fact many of these permit holders may not qualify for
30 lifetime access (though no data is available to support that opinion). Further, the
31 analysis does not include local crew or processing employees. The analysis also
32 understates the relative impact on communities like Petersburg, where many of
33 the region's Tanner crab fishermen live. All permit holders in the Tanner fishery
34 will be affected by closure of Glacier Bay, not just those with a history of fishing
35 in the Bay.
36
37

38 Summary 39

40 There is a great deal of uncertainty about how communities will be affected
41 economically over the long-term by commercial fishing restrictions in Glacier
42 Bay. However, using common-sense assumptions about multipliers and changes
43 in spending patterns it is possible to at least express these impacts in terms of
44 income losses. This assessment suggests that the present value of income losses
45 to communities, in addition to those measured for permit holders, crew,
46 processors, their employees and support businesses, could total between \$2
47 million and \$4 million. These estimates reflect lost economic benefit to
48 households, businesses and local governments from reduced indirect and
49 induced economic activity. These indirect/induced losses are in addition to
50 losses in fish tax revenue suffered by communities that have historically earned
51 such revenue, and communities that could at some point in the future have
52 earned such revenue.

Participation in Glacier Bay Fisheries, By Community
Number of Fishermen Potentially Qualifying for Lifetime Access

	Lifetime				Lifetime		
	Access	No Access	Total		Access	No Access	Total
Gustavus				Juneau			
Halibut	6	6	12	Halibut	24	28	52
Salmon	16	9	25	Salmon	144	97	241
Tanner	9	4	13	Tanner	7	9	16
Dungeness	4	11	15	Dungeness	1	13	14
Total	35	30	65	Total	176	147	323
Hoonah				Wrangell			
Halibut	8	7	15	Halibut	4	1	5
Salmon	90	28	118	Salmon	8	14	22
Tanner	4	2	6	Tanner	1	1	2
Dungeness	0	1	1	Dungeness	1	1	2
Total	102	38	140	Total	14	17	31
Pelican				Sitka			
Halibut	5	3	8	Halibut	2	4	6
Salmon	31	11	42	Salmon	87	120	207
Tanner	1	1	2	Tanner	4	3	7
Dungeness	0	2	2	Dungeness	0	3	3
Total	37	17	54	Total	93	130	223
Elfin Cove				All Others			
Halibut	0	1	1	Halibut	9	16	25
Salmon	29	8	37	Salmon	110	249	359
Tanner	0	2	2	Tanner	3	8	11
Dungeness	1	1	2	Dungeness	0	23	23
Total	30	12	42	Total	122	296	418
Haines				Grand Totals			
Halibut	12	24	36	Halibut	74	92	166
Salmon	9	9	18	Salmon	535	575	1110
Tanner	1	1	2	Tanner	35	41	76
Dungeness	0	1	1	Dungeness	7	57	64
Total	22	35	57	Total	651	765	1416
Petersburg							
Halibut	4	2	6				
Salmon	11	30	41				
Tanner	5	10	15				
Dungeness	0	1	1				
Total	20	43	63				

Notes: Salmon includes power and hand troll fisheries. Tanner includes pot and ring fisheries. "No access" includes fishermen with landings in Glacier Bay (or most relevant statistical area) but not during the number of years required to qualify for lifetime access. Because of data limitations, the number of trollers actually qualifying for lifetime access is likely to be much smaller than is indicated by this data. "Lifetime access" for Dungeness fishermen means fishermen that qualified for the buy-out. "No access" means those that did not qualify for the buyout.

Appendix

Tanner Crab (Pot) Fishery Annual and Total Losses

**Tanner Crab (Ring) Fishery Annual
and Total Losses**

Halibut Fishery Annual and Total Losses

Dungeness Crab Annual and Total Losses

Power Troll Fishery Annual and Total Losses

Hand Troll Fishery Annual and Total Losses

Groundfish Fishery Annual and Total Losses

King Crab Fishery Annual and Total Losses